TECHNOLOGY DEPT.

Devoted to
TEXTILE
CHEMISTRY
BLEACHING
DYEING
PRINTING
FINISHING

MARCH 15, 1943
VOLUME 32, No. 6

AMERICAN DYESTUFF REPORTER

PUBLIC LIBRARY
MAR 23 1943
DETROIT

Another *Amazing* Solophenyl* Color

To the growing list of Solophenyl colors has been added a true shade of Olive in

Solophenyl Olive G L Extra**

This new color is worthy of its place in the Solophenyl series because of its extreme fastness to light when applied on Cotton or Viscose Rayons. Moreover, it offers unusually good resistance to Washing and Water bleeding.

Solophenyl Olive G L Extra is most desirable as a self shade or shading element of other Solophenyl colors where the extreme in fastness to light is required of a Direct (substantive) dyestuff.

* *Registered*
** *Patented*

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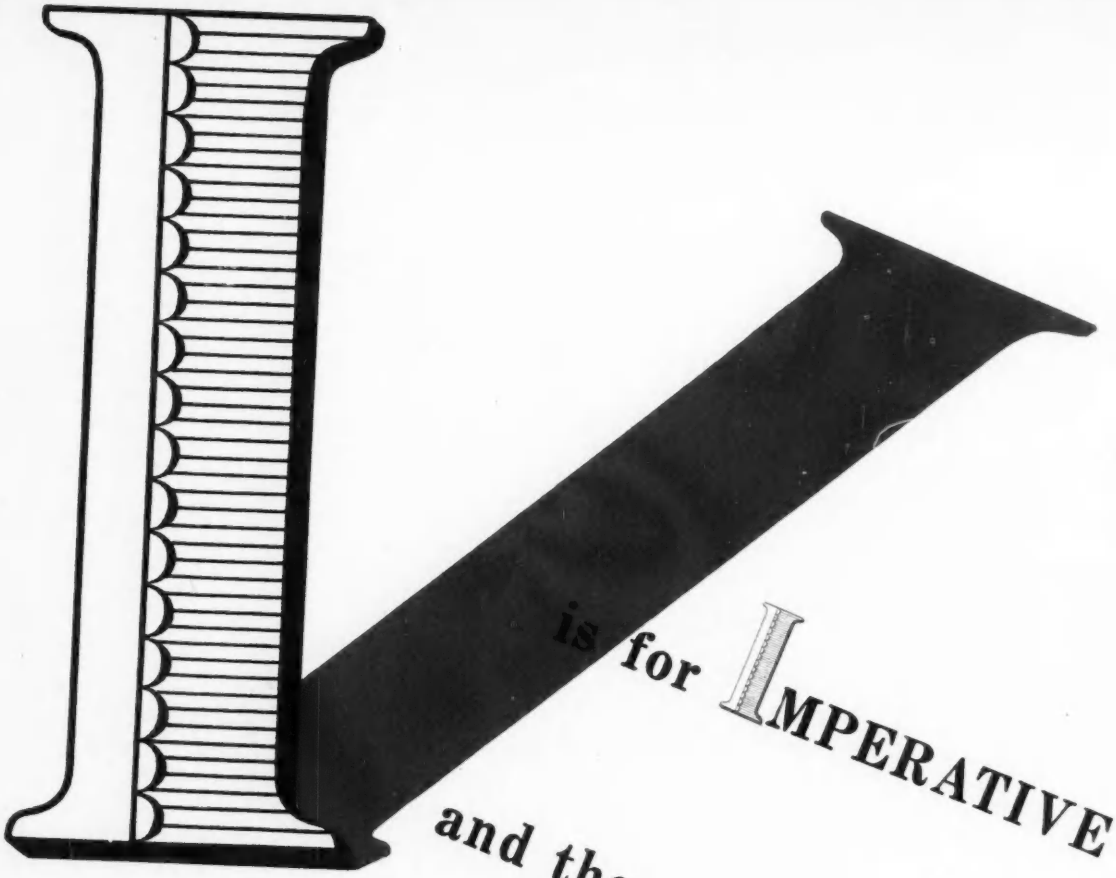
OFFICIAL PUBLICATION
of the
PROCEEDINGS
AMERICAN ASSOCIATION
OF TEXTILE CHEMISTS
AND COLORISTS



Ideas have always been the secret weapons of American progress...the ingenuity that has initiated new ways and means for getting things done better and faster.

In these times of emergency... of imperative needs for certain chemical materials, ideas born of chemical research have repeatedly come through. New materials and new uses for others now are making it possible to sustain an ever-mounting flow of supplies to war industries. Likewise, it is enabling many manufacturers of civilian goods to circumvent critical material shortages.

If you are confronted with a problem arising out of inability to obtain chemical materials for your high priority business, or if you are faced with suspended production due to the non-priority nature of your manufacture, call upon Cyanamid. Our research chemists and engineers will be glad to apply their facilities to the solution of your problem. There is no obligation.

AMERICAN CYANAMID
AND CHEMICAL CORPORATION
A Unit of American Cyanamid Company
30 ROCKEFELLER PLAZA, NEW YORK, N. Y.

MANUFACTURERS OF
SULPHONATED OILS • PENETRANTS • FINISHES • SOFTENERS
SIZING COMPOUNDS • DECERESOL* WETTING AGENTS
AND OTHER SPECIALTIES FOR THE TEXTILE INDUSTRY
*Reg. U. S Pat. Off.

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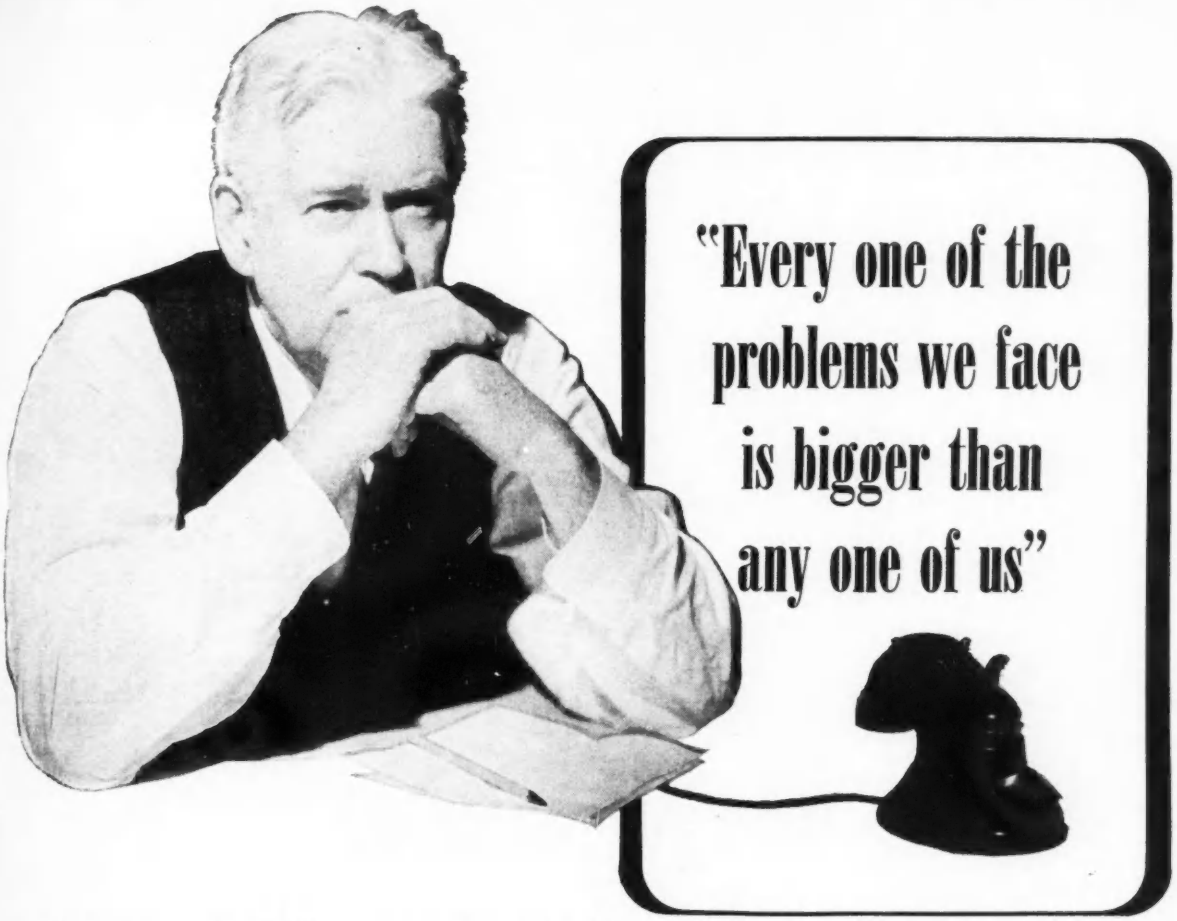

If it is a problem in dyestuffs = = let us help . . . . we're as close to you as the 'phone at your elbow!

The ever-increasing requirements of our Government must be met . . . . this means that shortages and substitutions will be necessary for civilian work.

Perhaps we have been over the roads you are contemplating and can point out the way. Tell us your story . . . whether it is about specifications for war work, or color limitations for civilian work.

Pick up the 'phone and get in touch with the nearest CIBA office.

★

The Ciba Laboratory Exists to Serve You!

Ciba Chemists, Colorists and Service Technicians are ready to co-operate with you to solve your problems.

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PROVIDENCE • SAN FRANCISCO • PHILADELPHIA

VAT DYES OF THE DOW CHEMICAL COMPANY

The Flags are going up all over America!

In this fateful hour, 130,000,000 Americans have pledged that we *shall not* fail. That is why every Army-Navy "E" that rises over the war plants of the nation causes American hearts to beat stronger with hope, with courage – and with renewed determination to fulfill their sacred pledge. For these flags are both a symbol of our strength . . . and a warning to our enemies that the day of their final destruction is drawing closer.

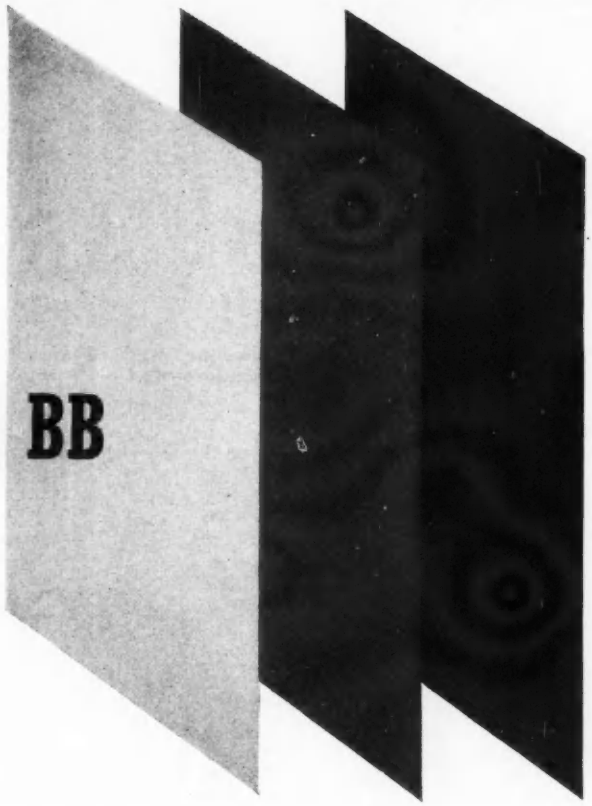
Today, the Army-Navy "E" flies over the Niagara Falls plant of the Mathieson Alkali Works. From this plant a continuous stream of chemicals flows into the nation's war industries . . . chlorine, caustic soda, ammonia, sodium methylate, sodium chlorite and high test calcium hypochlorite.

To the friends and industries who look to Mathieson for many of their essential chemical requirements, we express our appreciation for their cooperation and forbearance which has helped us maintain a record production of war materials. Teamwork like this will help raise other "E" flags over America's war plants – and will help keep them flying at full mast until victory is ours.

Mathieson **CHEMICALS**

THE MATHIESON ALKALI WORKS (INC.)
60 EAST 42ND STREET, NEW YORK, N. Y.

LIQUID CHLORINE . . . SODA ASH . . . CAUSTIC SODA . . . BICARBONATE OF SODA . . . BLEACHING POWDER . . . HTH PRODUCTS . . . AMMONIA ANHYDROUS and AQUA . . . FUSED ALKALI PRODUCTS . . . SYNTHETIC SALT CAKE . . . DRY ICE . . . CARBONIC GAS . . . SODIUM CHLORITE PRODUCTS



EASTONE* BLUE BB

Eastone* Blue BB, a chemically new type of blue dye for acetate rayon yarns, is outstanding for its resistance to gas fading. It may be used alone to produce a clear blue shade, or in combination with other Eastman acetate dyestuffs to produce a wide range of mixed shades. Rich, heavy shades may be obtained with the use of a relatively low percentage of Blue BB. It is one of the best acetate dyestuffs for washing fastness, and it can be used with excellent results on nylon as well as on acetate rayon fabrics.

Eastman acetate dyestuffs offer a wide variety of different colors especially developed for the dyeing of acetate rayon fibers and fabrics in which they are used. For information on Eastman acetate dyestuffs and their application, write to TENNESSEE EASTMAN CORPORATION (Subsidiary of Eastman Kodak Company), KINGSPORT, TENNESSEE.

EASTMAN ACETATE DYESTUFFS

**"Eastone" is a registered trade mark and denotes a type of dye which is dischargeable, in addition to being used for plain dyeing.*

Correct processing helped sell this cashmere sweater just as much as smartness of styling. For without correct processing there could have been no soft fleeciness of fabric. That's why leading mills, converters, finishers, and dyers invariably insist on Colgate-Palmolive-Peet high-quality processing agents. And remember—in spite of material and style changes that may result from the war, C.P.P. processing soaps and detergents are effective on any type of fabric.

Ask your local C.P.P. man for complete information on Colgate-Palmolive-Peet wetting, fulling, scouring and dispersing agents, or write to our Industrial Department at Jersey City, N. J.

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Jeffersonville, Indiana

COLGATE-PALMOLIVE-PEET CO.

Kansas City, Kansas
Berkeley, California

COLGATE KWIKSOLV • COLGATE FORMULA 25 • COLGATE WHITE SOAP FLAKES • ARCTIC CRYSTAL FLAKES • BADGER FLAKES

DURABILITY AND THE DURATION

Yardage by the mile...these few words best describe the tremendous demands now being made on American textile producers by our armed forces ☆ The material available for civilian use, therefore, must be processed to insure its maximum life ☆ Never was durability more at a premium ☆ There are ample supplies of high-class dyestuffs to meet military requirements and to color all civilian fabrics that will be manufactured.

GENERAL DYESTUFF CORPORATION

NEW!

The following announcement is of great importance to the textile industry and all Government depots interested in original chemical developments that are of definite help to the war effort.

PERMA—CIDE

for mildew proofing all types of military fabrics

In the March 29th issue of the Reporter we will advertise the results of various tests on this product as prepared by a recognized testing laboratory.

We suggest that you read it.

REFINED PRODUCTS CORP.

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Page & Newark Avenues - - Lyndhurst, New Jersey

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Originators of the Well Known PERMA PAR Products

Thirty-five foot high "Karbate" absorption tower equipped with graphite trays and bubble caps. One of many examples of the application of these materials.

Unique

in Properties and Performance

NATIONAL AND KARBATE
TRADE-MARK TRADE-MARK

CARBON AND GRAPHITE PRODUCTS

are being used successfully in a wide range of important applications in the mechanical, electrical and process industries because of the many advantages offered by their unique combination of physical and chemical properties.

- Resistance to severe thermal shock.
- No deformation at high temperatures.
- Not wet by molten metals — no sticking.
- Mechanical strength maintained at high temperatures.
- No reaction with most acids, alkalies and solvents.
- Low thermal expansion.
- High rate of heat transfer (Graphite and Graphite Base "Karbate" products).
- Low rate of heat transfer (Carbon and Carbon Base "Karbate" products).
- Good electrical conductivity.
- Self-lubricating.
- Available in impervious grades.
- Available in highly permeable (Porous Carbon and Graphite) grades.
- Easily and accurately machined and fabricated.
- Molded and extruded in special shapes when quantity justifies.

Carbon and graphite materials are available in the form of:
Brick, Blocks, Beams, Plates, Flat or Hollow Tile,
Slabs, Pipe, Tubes, Rods, Cylinders, Cement, Paste.

A variety of sizes permits fabrication of all types of equipment from small intricate parts to huge all-carbon structures.

•

Conventional design has been improved and simplified new design made possible by the use of "National" and "Karbate" carbon and graphite products. Following are some of the more important applications:

Heat Exchangers; Towers and Tower Equipment; Raschig Rings and other Tower Packings; Pipe, Valves and Fittings; Tanks, Tank Linings and Miscellaneous Containers; Filter and Diffuser Elements; Packing, Piston and Seal Rings; Bearings; Molds, Mold Plugs, Inserts and Stools; Ground Anodes; Welding Electrodes, Rods, Plates and Paste; Brushes and Contacts; Miscellaneous Electrical and Chemical Specialties.

NATIONAL CARBON COMPANY, INC.
Unit of Union Carbide and Carbon Corporation
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General Offices: 30 East 42nd St., New York, N. Y.
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ANNOUNCING

AQUATIZE is the result of the close collaboration of two outstanding laboratories... Aqua-Sec Corporation, manufacturers of Aqua-Sec Water Repellents, and Gallowhur & Co., makers of the Puratized Process.

AQUATIZE was perfected in response to the great demand for a single finish that would combine water repellency and bacteriostatic and fungistatic properties. Aquatize was compounded so that approximately a 6% solution, based on 100% pickup, will give a repellency rating of 90 or better, and will deposit .5% of Puratize on the fabric.

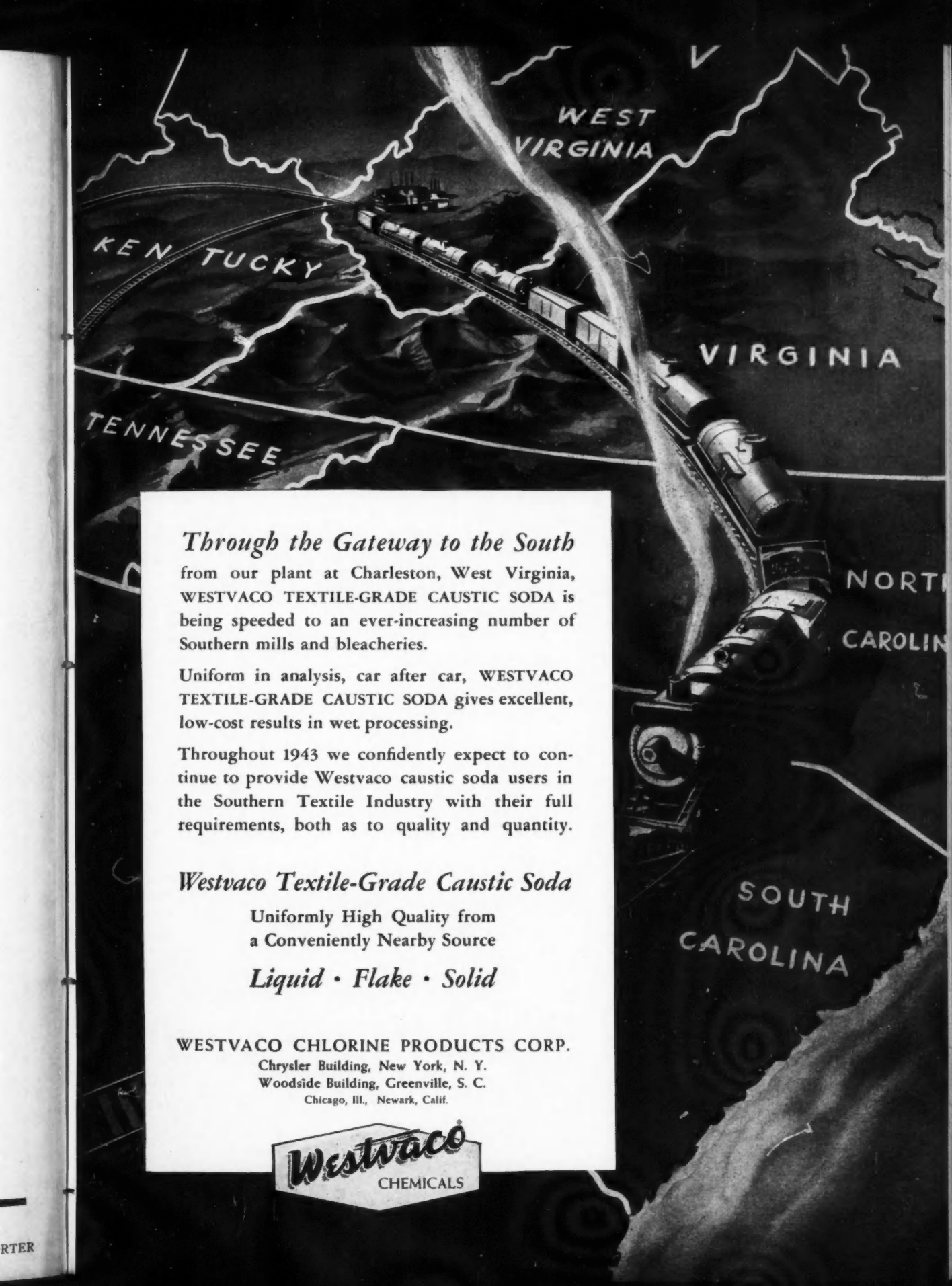
AQUATIZE offers the following specific advantages:

1. Water repellency, meeting government standards.
2. Lasting bacteriostatic and fungistatic properties.
3. Ease of application. No extra processing needed. May be dried at elevated temperatures.
4. Does not add toxic or irritating properties.
5. Free of objectionable odors.

● We invite inquiries on Aquatize from manufacturers and processors of textiles for the armed forces.

AQUA-SEC CORPORATION

1450 Broadway, New York



Through the Gateway to the South

from our plant at Charleston, West Virginia, WESTVACO TEXTILE-GRADE CAUSTIC SODA is being speeded to an ever-increasing number of Southern mills and bleacheries.

Uniform in analysis, car after car, WESTVACO TEXTILE-GRADE CAUSTIC SODA gives excellent, low-cost results in wet processing.

Throughout 1943 we confidently expect to continue to provide Westvaco caustic soda users in the Southern Textile Industry with their full requirements, both as to quality and quantity.

Westvaco Textile-Grade Caustic Soda

Uniformly High Quality from
a Conveniently Nearby Source

Liquid • Flake • Solid

WESTVACO CHLORINE PRODUCTS CORP.

Chrysler Building, New York, N. Y.
Woodside Building, Greenville, S. C.
Chicago, Ill., Newark, Calif.

Westvaco CHEMICALS

There's SELECTIVITY in Ahcopel

MILITARY USES FOR AHCOPEL

Uniforms

Shelter Tents

Camouflages

Webbing

Sleeping Bags

Parachute Cords

You're not limited to one type in motor cars, clothing or many other things you buy. Why then should you be limited to one type in a water repellent, particularly when the conditions under which it is used are far from constant?

Recognizing this fact, we offer a number of different types of Ahcopel for different purposes, and you may select the type best suited to your requirements and your pocketbook.

We can supply a type which will:—

1. Meet government specifications as to water repellency.
2. Meet government specifications as to mildew resistance.
3. Provide a high degree of resistance to spots and stains.
4. Leave the fabric porous.

Ahcopels can be applied by single bath method in dye jig, padder, quetch, or jig.

For additional information, write

ARNOLD, HOFFMAN & CO., INC.

Established 1815 • Plant at Dighton, Mass.

PROVIDENCE, RHODE ISLAND

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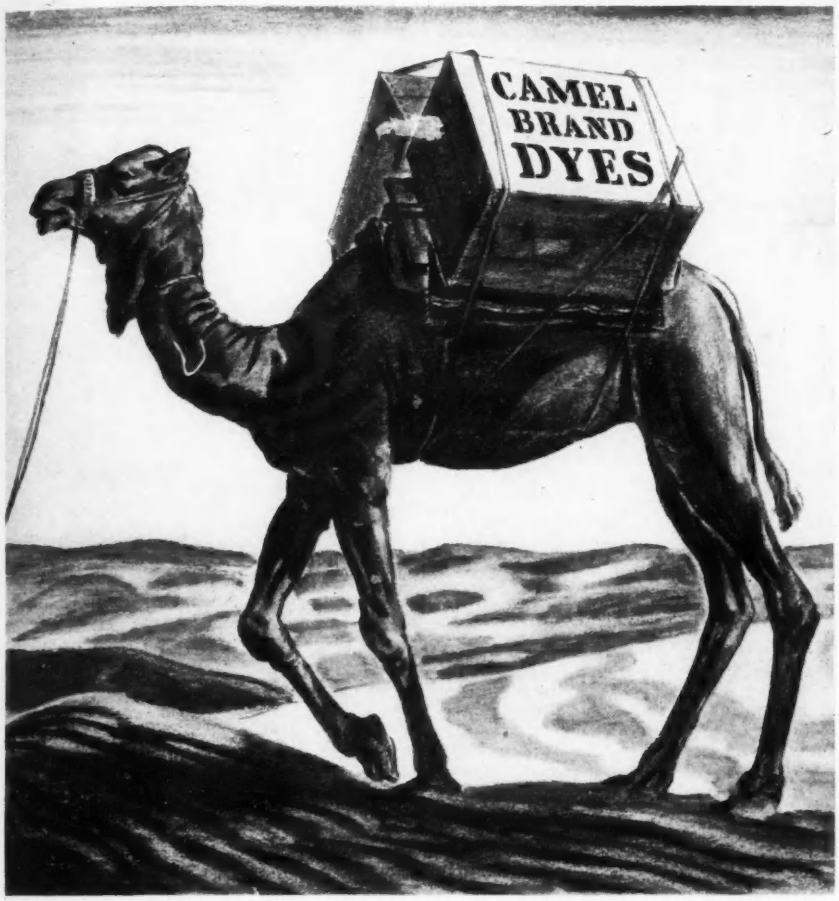

ACEKO
(Acid)

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AMIDINE
(Direct)

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AMIDAZO
(Develop)

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ETHONIC
(Level Dyeing Acid)

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KROMEKO
(Chrome)

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CAMACYL
(For Acetate Rayons)

•

LAVOSAL
(Fast to Salt Water and Washing)

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AMALTHION
(Sulphur)

•

SOL-AMIDINE
(Light-fast, Direct)

•

CHROMAZINE
AND
CHROMACID
Colors for Textile Printing

EXPERIENCE

When a dyestuff organization has served the textile industry continuously for more than 66 years the question of supplying dyestuffs is not a problem. *Call Campbell.*

JOHN CAMPBELL & COMPANY, Inc.

75 HUDSON STREET • NEW YORK CITY

TELEPHONE: BArclay 7-6228-6229

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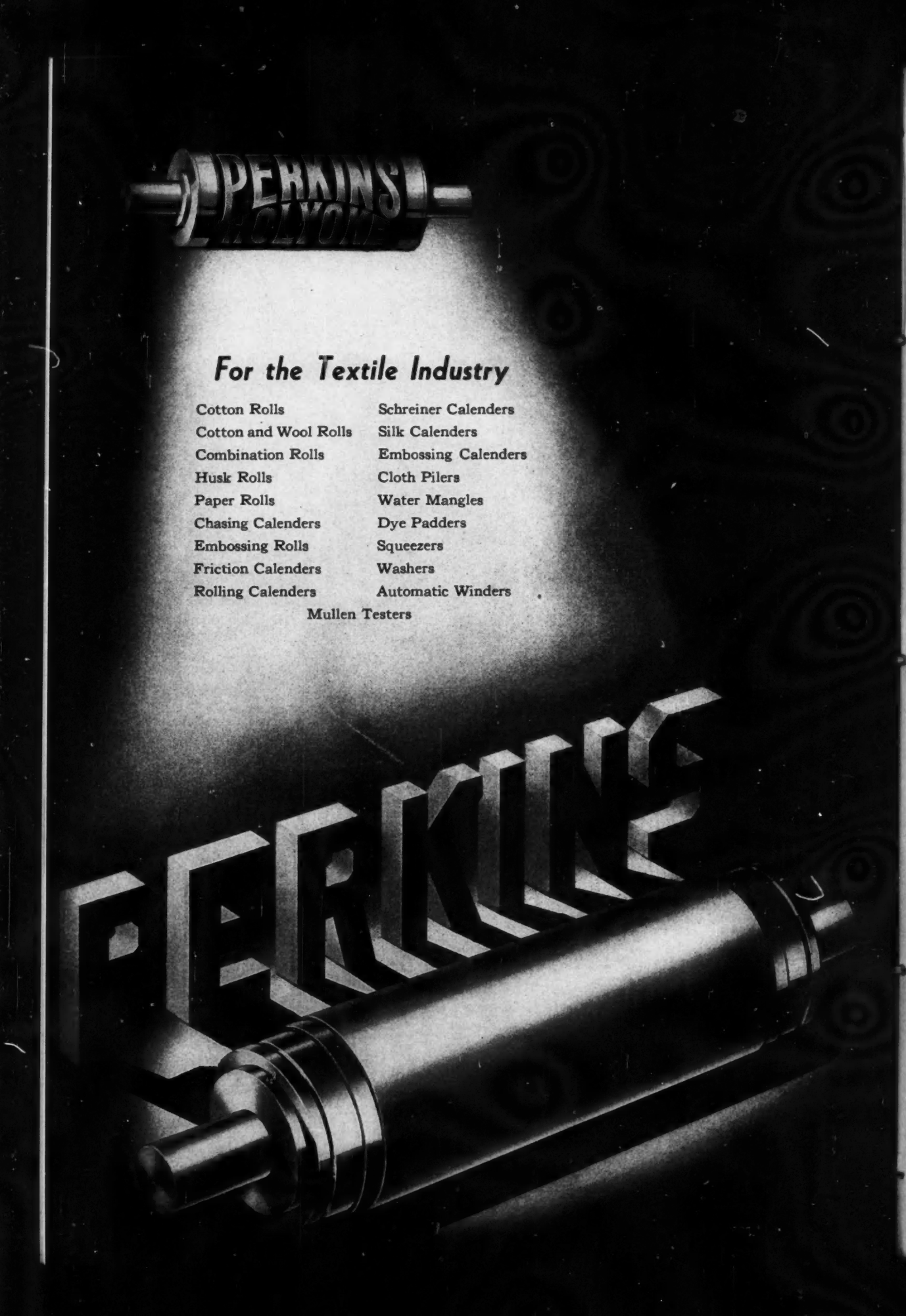
PERKINS
ROLLYORK
For the Textile Industry
Cotton Rolls
Cotton and Wool Rolls
Combination Rolls
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Paper Rolls
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Friction Calenders
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Washers
Automatic Winders
Mullen Testers
PERKINS

A DIFFERENT WAR? YES!

. . . and a different war presents new and difficult problems.

Uncle Sam's fighting men in the jungle, in the Arctic, on the desert - - all over the world - - are demanding fabrics finished to meet the extreme conditions of this *new* kind of war. ● Arkansas' vast peacetime experience is now solving wartime problems . . producing for textile processing and finishing plants products that meet exacting government specifications.

FRONT LINE PRODUCTS

FUNGICIDE G For mildewproofing all types of cotton cloth used in sleeping bags, webbing, tentage, mosquito netting, etc.

ARKO FIRE RETARDANT For flame-proofing uniform cloth, tentage, felts, etc.

CULOFIX L* For preventing color-bleed in water of direct dyed cotton.

AQUAROL* Produces a water-repellent finish on uniform cloth, overcoatings, and other military fabrics . . used in a single bath treatment with Fungicide G to impart water-repellency and mildew resistance . . used in a single bath treatment with Arko Fire Retardant to produce water-repellency and fire-resistance.

*REG. U.S. PAT. OFF.

ARKANSAS CO. INC.

NEWARK · NEW JERSEY

NEW THINGS *via* MODERN CHEMISTRY

are helping mightily to win VICTORY... SOONER!

PHIL-PRO-TEX is the new finish that makes canvas last longer... because it makes canvas not only water-proof and rot-resistant, but FLAME-Resistant as well.

When Victory is Won, this war-time experience will make available awnings and canopies of flame-retardant canvas . . . lasting hatch and life-boat coverings . . . long life and really protective tarpaulins and merchandising coverings.

PHIL-PRO-TEX finished canvas does not have a tendency to stiffen and crack in cold temperatures . . . nor to become gummy and sticky at high temperatures.

An informative booklet will be sent to those interested.

TRULY ANOTHER TRIUMPH FOR CHEMISTRY

★ ★ ★ ★ ★ ★ ★

★ *On March Ninth,* ARMY E NAVY *Nineteen Forty-Three* ★

★ **THE MEN AND WOMEN OF THE PHILADELPHIA TEXTILE FINISHERS, INC. (the makers of PHIL-PRO-TEX) will receive the coveted Army-Navy "E" Award for outstanding achievement in the production of War Equipment. ★ This honor and recognition obviously belongs to each and every employee, executive . . . and to the cooperative suppliers of essential materials. ★ To this team credit is due.** ★

★ ★ ★ ★ ★ ★ ★

PHILADELPHIA TEXTILE FINISHERS, Inc.

3701 NORTH BROAD STREET

PHILADELPHIA

William L. Barrell Co., Selling Agent, 40 Worth Street, New York, N. Y.

This advertisement is of special interest to dyestuff Manufacturers and Finishers

ST. GEORGE'S "SALYNA" REG. U. S. PAT. OFF. JOINS THE NEW "CROWN" TESTED PLAN REG. U. S. PAT. OFF.

No. 4 of a series—from our confidential files on the new "CROWN" Tested Plan

Why did St. George go CROWN Tested, now when fabrics are in such great demand and so easy to sell? There's one of those "S64 questions" for the experts.

The answer is brimful with meaning. St. George and its finisher, Glenlyon Print Works, see eye to eye with us on giving the consumer the ultimate in value.

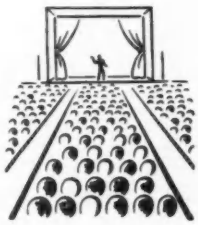
"Salyna" is a linen-like weave of 79% CROWN Spun Rayon and 21% cotton. You know the nation wide reputation this fabric has enjoyed in piece goods, daytime dresses and sportswear. A reputation worth guarding! And guarded it is under the CROWN Tests. Each dye lot is tested under American Viscose Corporation's 48-hour service plan.

Here are some of the tests every dye lot of "Salyna" must pass to qualify as CROWN Tested for women's sportswear:

	WASHABLE COLORS (identified by green disc)	HAND WASHABLE COLORS (identified by amber disc)
Tensile strength	35 lbs.	35 lbs.
Seam slippage	15 lbs.	15 lbs.
Dimensional restorability	2%	2%
Laundering temperature	160° F.	105° F.
Perspiration	Acid and alkali	Acid and alkali
Sunfastness	40 hrs. fadeometer	40 hrs. fadeometer

St. George believes in informative labeling. The green-disc tag identifies truly *washable* colors in "Salyna"—colors that can be *washed by machine* either at home or by a commercial laundry. The amber-disc tag is used on the *hand washable* colors. Here's service to consumers—vital facts at a glance!

"No conservation in unsatisfactory products"



Did you hear Frank L. Walton's address at the Wholesale Dry Goods Institute Meeting?* As director of the Textile, Clothing and Leather Division of WPB, he outlined the textile industry's position in the war effort. And do you remember his point?—"There is no conservation in cheap or unsatisfactory products."

Here's a challenge for all of us—a sign pointing in the direction we must all travel if we are to help in every way we can to bring about Victory in '43.

The CROWN Tested Tags—and the facts they stand for—are our pledge to America's consumers. To weavers, converters, and finishers, we offer the facilities of our research laboratories and the Textile Unit, our research plant for the continuous improvement of American textiles.

*Reported in Daily News Record, Jan. 22, 1943

GREEN DISC
for washable fabrics
AMBER DISC
for hand washable fabrics
RED DISC
for fabrics that can be dry cleaned only
CROWN TESTED AND APPROVED RAYON FABRIC
WASHABLE "CROWN" TESTED
HAND WASHABLE "CROWN" TESTED
AMERICAN VISCOSE CORPORATION
All "Crowns" Tested rayon fabrics contain "Crowns" Rayon.

NEW INFORMATIVE LABELING!
Consumer Satisfaction by the "Three Tag System!"

"CROWN" TESTED RAYON FABRICS

REG. U. S. PAT. OFF.

AMERICAN VISCOSE CORPORATION

Producers of CROWN *Rayon Yarns and Staple Fibers*

Sales Offices: 350 Fifth Avenue, New York City; Providence, R. I.; Charlotte, N. C.; Philadelphia, Pa.

Copr. 1943—American Viscose Corp.

Wide Range of use is Big Feature of

Indigosol Golden Yellow IGK

THE present price of Indigosol Golden Yellow IGK makes possible the use of this very fast Indigosol for economical dyeing and printing operations.

In combination with Indigosol Green IBA, very fast green shades are now available to the printer and dyer for the first time at a very reasonable cost.

An excellent printing color on cotton and rayon, it is also of great interest to the dyer of cotton, rayon and wool.

In ease of application, the perfectly level shades obtained, and the unusually excellent penetration of heavy goods makes the entire line of INDIGOSOLS especially valuable to the fast color dyer or printer.

Brightness and Economy are Characteristics of

Pharmasol Golden Yellow N

PHARMASOL Golden Yellow N produces clear, bright, fast and economical golden yellow shades when printed on cottons or rayons.

When mixed with Pharmasol Scarlet GNN, or Pharmasol Red GNN, a complete range of **Tangerine and Gold Shades** can be obtained.

Low cost Browns are obtained by mixing with either Pharmasol Blue GNXX or with Pharmasol Blue GDNN.

PHARMASOLS are solutions of stabilized azoic dyes and adjusted to the most practical concentration which can be easily applied with a maximum of efficiency.

PHARMASOLS solve the problem of troublesome dissolving and the uncertainties thereof—and as there is no decomposition there can be no loss of material or value.

CARBIC COLOR AND CHEMICAL CO., INC.

451-453 Washington Street, New York City

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PHILADELPHIA
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CHARLOTTE, N. C.

IMPORTERS OF THE MANUFACTURES OF
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EXCLUSIVE DISTRIBUTORS OF
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AMERICAN DYESTUFF REPORTER

A. P. HOWES
Publisher

LOUIS A. OLNEY, D.Sc.
Directing Editor

NORMAN A. JOHNSON, B.T.C.
Managing Editor

MYRON D. REESER
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Official Publication of the Proceedings of the American Association of Textile Chemists and Colorists

MARCH 15, 1943

VOLUME 32 NUMBER 6

American Dyestuff Reporter, Vol. 32, No. 6, Mar. 15, 1943. Published every other Monday. Copyright, 1943, by Howes Publishing Co., 440 4th Ave., New York, N. Y. Domestic subscription, $5.00, Canadian, $6.00, Foreign, $6.00. Entered as second-class matter, Nov. 6, 1919, at the New York, N. Y., Post Office, under the act of March 3, 1879.

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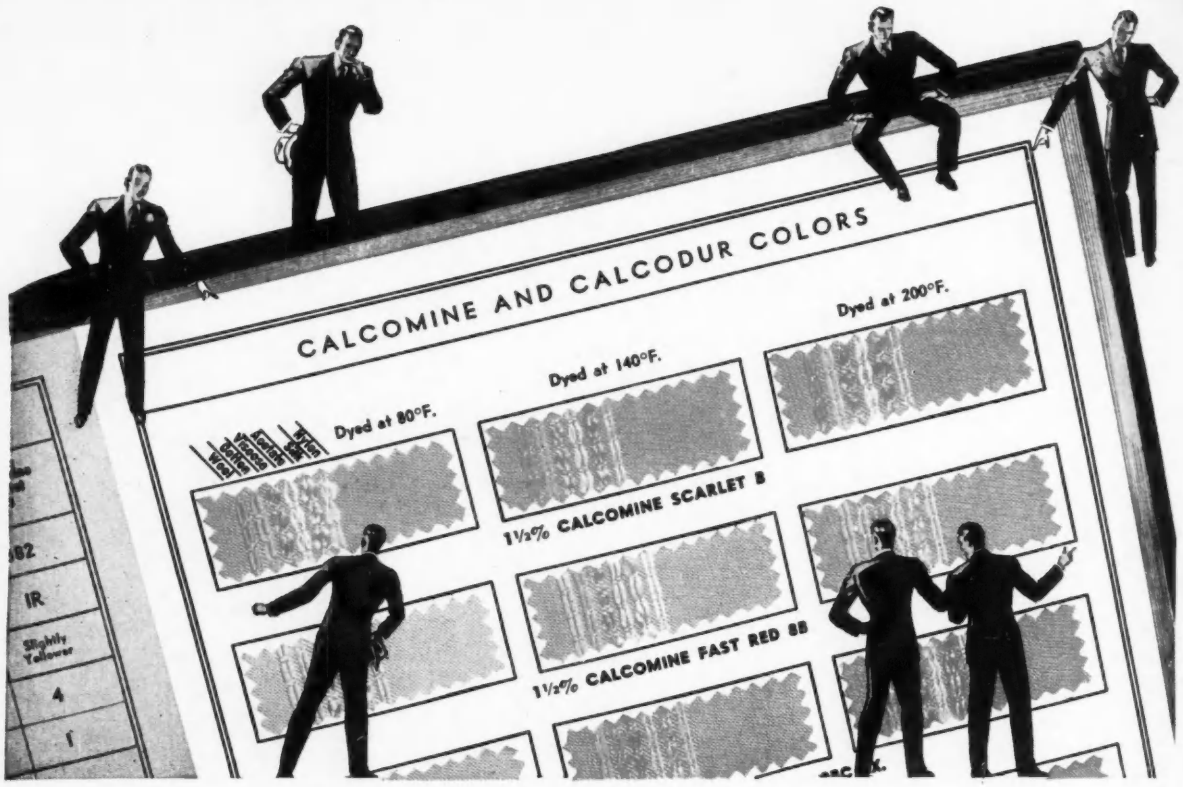

What every colorist wants to know about Viscose Rayon

HOW WILL rayon's individual characteristics affect the direct dyeing of fabrics? Further, with the tremendous, war-spurred use of rayon *mixtures,* what will be their behavior in the dye-bath?

Here at Calco, our chemists have made a thorough study of the behavior of dyes on this fiber. And their findings are summarized in the newly published Calco Shade Card, "Direct Colors on Viscose Rayon."

This volume shows the exact shades of Calco direct dyes upon viscose rayon piece goods containing floaters of cotton, wool, viscose rayon, acetate rayon, silk, and nylon . . . dyed at 80°F.; 140°F.; 200°F. In addition, the study includes a detailed summary of the various fastness properties, including light, metals, perspiration, and washing.

But no single volume could encompass all your specific problems. This Calco Shade Card merely emphasizes the value of coming directly to color headquarters—Calco—with your problems. Our technical staff is always ready and anxious to serve you.

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DYESTUFF REPORTER

VOLUME 32 MARCH 15, 1943 NUMBER 6

Comparison of an Aryl Sulfonate and Soap for the

WASHING IN HARD WATER

of Cotton, Linen, Spun Cellulose-Acetate Rayon, Spun Regenerated-Cellulose Rayon, Silk, and Wool*

VIRGINIA ESTER, RUTH DONOHUE, MILDRED BARR, FLORENCE BARR CASTONGUAY, LOIS DALE, DON SHEPARD, and RACHEL EDGAR

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THE washing of undyed cotton, linen, spun cellulose-acetate rayon, spun regenerated-cellulose rayon, silk, and wool[8] with 0.2 per cent of a sodium aryl sulfonate in hard water at 40° C. has been compared with the washing of these fabrics in hard water with or without 0.5 per cent of a sodium soap by analysis of the residual fabrics after one, ten, twenty, thirty, forty, and fifty washings. The fabrics (Table I) were all analyzed for absorption of light, ash, distribution of yarns by number and weight, elongation at breaking load, strength, and weight; the wool was also analyzed for moisture, sulfate, and total sulfur.

Low values for absorption of light by soap-washed cotton, linen, regenerated-cellulose rayon, silk, and wool are ascribed to residual alkaline-earth soaps rather than to whitening of these fibers (Table II).

The ash of each textile, except that of the silk washed with hard water, increased upon washing although the first washing of silk with soap removed half of the initial ash (Table III). Ash of proteic fibers washed with aryl sulfonate or soap was greater than that of cellulosic fibers washed with these detergents; the ash of the soap-washed wool was greater than that of the soap-washed silk and the ash of each of these fibers as well as that of cotton and linen increased more with soap than with aryl sulfonate. The residual ash of the regenerated-cellulose rayon was raised more than that of the cellulose-acetate rayon and both detergents left the same amount of ash. As the number of washings increased, precision among parallel determinations based on weight of soap-washed fabric was lowered due to dusting of the powdery alkaline-earth soaps.

Relative weights of warp and filling yarns in a washed fabric reflected shrinkage but showed no definite pattern for loss of weight by either set of yarns (Table IV).

The slight shrinkage of the wool with soap, contrasted with its great shrinkage with aryl sulfonate, and the protection from excessive shrinkage with hard water which soap provided this wool are shown in Table V. The wool washed with hard water and soap (pH of 9.78) shrank as when washed with hard water alone if rinsed with distilled rather than with hard water (Table VI). Rinsing with conductivity water did not lessen the shrinkage of the wool 2/2 twill[24] washed in hard water at an optimal temperature of 40°C.[17] with alkali alkyl sulfate, alkali aryl sulfonate, or alkali glyceryl sulfonate. The wool, washed in hard water alone or with any of these detergents, felted to a thick compact sheet, not in the first[21] but in fewer than ten washings[22]. There seems to be no relation between the rate of shrinkage of the wool with hard water, aryl sulfonate, or soap and the initial pH of these solutions[37]. Naphthalene sulfonate[38] and a hydroxyethanesulfonate[32] have been patented for shrinking wool. Shrinkage of the other fabrics washed with hard water, aryl sulfonate, or soap varied no more than deviations of their yarn counts; the high filling shrinkage of the silk crepe was due to relaxation.

Although wet strength of all the fabrics was lowered by washing (Tables I and VII), only the linen of high yarn number[34], frequently described as weakened by laundering[33, 11, 23, 26, 16, 29, 35, and 13], lost so much as half its initial strength during fifty washings, a criterion for failure in use[15]. The greater percental loss suffered by linen and cotton, compared with spun cellulose-acetate rayon, reflects the initial high wet strengths of the linen and cotton and low wet strengths of this rayon; the loss of wet strength by both spun rayons is similar to that

* This work, done for General Mills, Inc. during the summer of 1939 in the laboratories of the Department of Chemistry at Iowa State College, Ames, Iowa, is published with the approval of General Mills, Inc.

TABLE I
Analysis of Fabric

Fabric	Weave	Weight ounces per square yard	Thickness inch	Absorption of light percentage	Ash percentage of fabric	Length of Fiber Warp inch	Length of Fiber Filling inch
1. Cellulose-acetate rayon sacking	plain	4.61(0.02*)	0.0113	16.0	1.61	1.9(0.0)	1.9(0.0)
2. Cotton muslin sheeting	plain	4.43(0.03)	0.0080	8.1	0.03	1.2(0.0)	0.9(0.0)
3. Linen handkerchief sheer	plain	1.74(0.01)	0.0041	7.6	0.08	1.4(0.2)	1.4(0.1)
4. Regenerated-cellulose rayon muslin	plain	3.20(0.03)	0.0071	12.1	0.25	1.4(0.0)	1.4(0.0)
5. Silk crepe	plain	2.43(0.05)	0.0055	16.0	2.09**	continuous	continuous
6. Wool twill ***	2/2 twill	5.93(0.04)	0.0123	29.8	0.76	2.9(0.1)	0.7(0.2)

* Mean deviations are within parentheses.
** This ash contained no trace of tin.
*** The fabric contained neither selenium[10] nor sulfite[14].

Table I. Analysis of Fabric (Continued)

Fabric	Breaking strength of fabric: Warp Conditioned pounds per inch	Warp Wet percentage of conditioned	Filling Conditioned pounds per inch	Filling Wet percentage of conditioned	Elongation of fabric at breaking load: Warp Conditioned percentage	Warp Wet percentage	Filling Conditioned percentage	Filling Wet percentage
1. Cellulose-acetate rayon sacking	33(1*)	67	33(1)	73	23	32	24	42
2. Cotton muslin sheeting	49(3)	106	52(5)	96	12	19	21	29
3. Linen handkerchief sheer	45(4)	116	20(1)	140	7	8	8	15
4. Regenerated-cellulose rayon muslin	45(2)	51	28(1)	50	19	19	26	23
5. Silk crepe	48(4)	81	39(2)	77	29	45	41	59
6. Wool twill	27(0)	70	14(0)	71	35	56	35	55

* Mean deviations are within parentheses.

Table I. Analysis of Fabric (Continued)

Fabric	Type of yarn: Warp	Type of yarn: Filling	Distribution of yarns: By number: Warp number per inch	By number: Filling number per inch	By weight: Warp percentage of fabric	By weight: Filling percentage of fabric	Yarn number: Warp typp	Yarn number: Filling typp	Twist of yarn: Warp number per inch, direction	Twist of yarn: Filling number per inch, direction
1. Cellulose-acetate rayon sacking	two-ply	single	46(0)*	40(0)	43.6	56.2	13.74(0.05)	9.43(0.08)	ply 14.2(0.3)S	
									single 4.6(0.2)Z	8.7(0.2)Z
2. Cotton muslin sheeting	single	single	75(0)	71(1)	48.5	51.1	20.1 (0.2)	20.73(0.18)	18.3(0.2)Z	11.6(0.1)Z
3. Linen handkerchief sheer	single	single	77(1)	67(0)	59.1	40.9	42.62(1.04)	56.3 (1.1)	1.6(0.1)Z	4.2(0.0)Z
4. Regenerated-cellulose rayon muslin	single	single	72(1)	61(1)	55.6	44.4	24.09(0.05)	27.91(0.41)	15.4(0.1)Z	7.3(0.1)Z
5. Silk crepe	multifilament	crepe	170(1)	84(1)	56.0	44.0	82 (0)	52.6 (1.0)	<1	57.2(0.5)S**
										51.3(0.5)Z**
6. Wool twill	worsted	woolen	54(0)	42(1)	36.4	62.8	15.2 (0.1)	7.38(0.3)	11.7(0.4)S	7.8(0.6)S

* Mean deviations are wtihin parentheses.
** Two filling yarns of S twist alternate with two of Z twist.

shown by continuous-filament cellulose-acetate rayon and regenerated-cellulose rayon washed with soap, silicated soap, or sulfated alcohol in distilled water[6] and has been described as due mainly to mechanical action while wet[30]. The cellulose-acetate rayon, cotton, and regenerated-cellulose rayon lost 8, 15, and 25 per cent, respectively, in wet strength during fifty washings whether washed with hard water alone or with aryl sulfonate or soap. In general the weakening of the spun regenerated-cellulose rayon was between that of cotton and linen as observed by Walter[39]. The high wet strength of the silk washed with aryl sulfonate, compared with this silk washed in hard water with or without soap, is a decided contrast to the 86 per cent loss of wet strength by a silk during fifty washings with 0.5 per cent sulfated alcohol in distilled water[6]. High values for wet strength of wool washed with hard water and soap, contrasted with wool washed in hard water with or without aryl sulfonate, are not explained by the small error in counting yarns of the felted fabric.

Table VIII shows the 33 per cent decrease in elongation suffered by the silk during fifty washings according to any of the methods and the much greater elongation of the more felted wool as contrasted with the soap-washed wool.

Table IX presents, as percentage of the original fabric, the weight of the washed fabric and this weight corrected for shrinkage. Figures for the latter show that linen lost approximately the same weight when washed in hard water alone or with aryl sulfonate or soap. The increased weights of the soap-washed regenerated-cellulose rayon, cotton, silk, and wool are in the order of relative sorption of soap by these fibers[41, 28]; the increased weights of silk and wool washed with aryl sulfonate in hard water are in the same order as resulted when these fibers were washed with sulfated alcohol in distilled water[6]. Monoalkyl monohydroxy benzenesulfonates have been patented as impregnating agents for textiles[12]; Warwicke observed that woolen serge sorbed approximately three times more sodium cetyl sulfonate than sodium cetyl sulfate while cotton took up but little more of the sulfonate[40].

The wool washed with aryl sulfonate increased in total sulfur but not in sulfate while the wool washed in hard

(Continued on Page 135)

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MARCH 15, 1943

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APPLICATION OF VINYL RESINS AND PLASTICS TO TEXTILES*

C. W. PATTON

Plastics Division, Carbide and Carbon Chemical Corp.

YOUR program committee suggested at first that the *future* of the application of vinyl resins, or plastics, to textiles be discussed tonight. Then, upon further consideration, it was decided that rather than embark upon nebulous prophesies, a greater service could be performed by delineating the properties of vinyl resins now being produced and a few of their applications in the war effort, primarily, those wherein textiles perform a vital co-function. Just as in surveying, a back-sight is a necessary pre-requisite to an accurate fore-sight, possibly we can consider a delineation of the present as a necessity before looking to the future. Your program committee's original suggestion is both evidence of the committee's awareness of the rapid growth of applications in which both textiles and vinyl resins join to make an improved product, and also, I believe, evidence of the attitude of members of the textile industry in general.

So beyond saying that numerous investigations are underway which very probably will exert a profound influence in time to come, we will revert, so to speak, from the future to the present.

Before describing various uses of the vinyl resins, the following table (Table I) will aid you in identifying a few of the typical resins.

These resins are all synthetic, thermoplastic materials. That is, they are softened by heat, rather than hardened, as are thermosetting resins. They are often spoken of as coming from coal, salt water, natural gas and air. True as this may be, it is a slight over-simplification that may be confusing to the ultimate consumer. It is somewhat like telling the purchaser of a fine $3.50 cotton broadcloth shirt that it was made from sunshine, air, water, and dirt.

*Presented at meeting, New York Section, January 29, 1943.

The vinyl chloride-acetate resins are prepared by mixing vinyl chloride, a gas, with vinyl acetate, a liquid, and reacting the two together. The proportion of each present influences the properties of the final product. The degree of reaction, or polymerization, also influences the properties of the finished resin. As can be seen, the two variables, per cent vinyl chloride and degree of polymerization, permit the production of an infinite number of related resins. The first three resins, VYNW, VYNS, and VYHH represent three of the more commonly used types. These resins are completely reacted in the process of manufacture, hence the user or processor has no further chemical reactions to perform. Subsequent operations are primarily physical, such as mixing with colors, plasticizers, extenders, and lubricants and hot-calendering the mix onto cloth. If cloth is to be spreader-coated, or impregnated, the resin and other necessary ingredients are put into a fluid form by the addition of organic solvents. For certain uses these liquefied forms, or solutions, are dispersed in water to produce emulsions.

Somewhat the same applies to the remaining resins, with the exception that the vinyl butyral resin, which due to its chemical structure, can be further reacted with thermosetting resins.

You will become more familiar with the symbols of these various resins as they are correlated with properties of the end product.

APPLICATIONS

Relatively recently, some of the first, if not the first, non-rubber pontoons were made of heavy duck coated on both sides with a VYNW resin compound. After inflation, army trucks dragged them over stony ground until they were worn out. However, the trucks drove

TABLE I
"Vinylite"* Brand Vinyl Resins

Chemical Name	*Mfr's. Symbol*	*% Vinyl Chloride*	*Soluble In*	*Physical Form*
Vinyl chloride-acetate resin	VYNW	93	Certain ketones	Dry white powder
Vinyl chloride-acetate resin	VYNS	90	Ketones	Dry white powder
Vinyl chloride-acetate resin	VYHH	88	Ketones	Dry white powder
Vinyl chloride resin	QYNA	100	Certain ketones	Dry white powder
Vinyl acetate resin	AYAF	0	Practically all organic solvents except aliphatic hydrocarbons	Colorless lumps
Vinyl butyral resin	XYNC	0	Alcohols, esters	Moist flake, granules

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several times farther than ever before in wearing out previous materials.

Many of you have watched your young hopefuls get on a scooter and dash madly down the sidewalk using the toe of their shoe for a brake. Similarly, the toes of children's shoes make good rudders when sledding. Kicking rocks and tin cans in the absence of a football also adds up to the fact that in the past it has been almost impossible to keep an active youngster's shoes in presentable condition. Covering the tips of the shoes with flexible VYNW resin sheeting, colored and embossed to match the leather used for the balance of the shoe upper, definitely holds the toes in. During wear tests, the leather soles or uppers have failed badly, whereas the vinyl plastic tipping remained in good condition. What formerly was the weak point of a shoe became the strongest point.

In the earlier stages of this tipping development, considerable trouble was experienced when the plastic tips were stretched excessively during the toe-forming operation. The continual stress exerted by the extended plastic would gradually flatten even the stoutest box toe. Textiles came to the rescue—the VYNW resin plastic sheeting was backed with a sturdy cloth and as a result the combination could not be stretched excessively during the toe-forming operation and the toes were no longer flattened.

Fire, in addition to gun fire, is obviously an ever-present hazard in our armed forces. For this reason, practically all truck covers, supply and equipment covers, and miscellaneous tarpaulins are treated with fire and weather resistant compounds. Considerable quantities of VYHH type vinyl chloride-acetate resin, mixed with chlorinated paraffins and other materials, have been applied to duck used by our armed forces. The use of vinyl chloride-acetate resins, because of other even more pressing needs, has been confined to those types of covers where other fire-proofing agents would not serve.

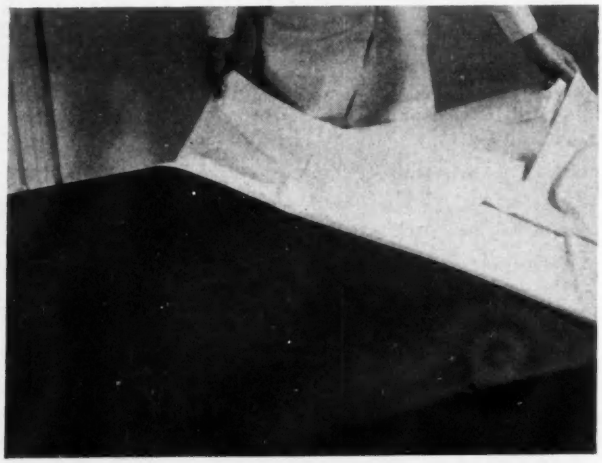
Another application, while not one involving the use of textiles, is an interesting one which illustrates another outstanding property of vinyl chloride-acetate resin VYNS. Instruments for aerial and marine navigation, artillery range finding, etc., must retain their original dimensions within very narrow limits even though exposed to high humidity, water and rough treatment in field use. When fabricated out of rigid vinyl plastic sheet, these instruments meet these requirements.

By the use of vinyl chloride-acetate resin VYNW, airplanes are enabled literally to carry their own hangers. Upon landing in emergency fields or out-of-the-way places, the planes are covered with a light weight paulin. Then if snow and ice fall on the plane, it can be readily removed by the simple expedient of loosening the cover and pulling it off. Since these covers may also be used for camouflaging, some of them have to withstand tropical heat as well as arctic cold. Originally heavy duck paulins were used. These were replaced by relatively light-weight plasticized vinyl chloride-acetate resin sheeting. In the ever constant struggle to decrease the weight of aviation equipment, the use of still thinner resin sheeting was tested. It was found that, at the degree of plasticization necessary to give low-temperature flexibility, the sheeting lacked the requisite tensile strength. Textiles, forgetting their former rebuff, so to speak, came to the rescue and furnished the "backbone" for a still lighter weight aircraft paulin. The vinyl chloride-acetate resin furnishes the water-and-weather resistance.

The lack of toxicity and odor of vinyl chloride-acetate resins is well shown by their use as a coating for food bags for the army. Various foods, such as meats, can be transported to the field kitchens in these convenient packages, protected against damage, or contamination from dust, water, and any oil, grease, or other non-edible material that may normally be found in a transport truck bed. Paper, coated with this type of resins, forms the cap-liner for thousands of foods and pharmaceutical products packaged in glass. In normal times, this type of resin also formed the liner for beverage cans. Collapsible water bags made of heavy duck water-proofed with vinyl butyral resin reacted with thermosetting materials, have been produced for our armed forces. These bags hold approximately twenty-five gallons and have several spouts so that water can be rapidly dispensed into canteens by the troops. Another recent packaging development involves the use of a vinyl resin coated cloth bag in a heavy cardboard container for shipping syrups and other food products.

Many of you are familiar with the flexible transparent sheet plastic used in making belts and uppers for ladies' shoes. No one would ever suspect that encasing a lady's foot in a transparent flexible sheet of plastic would present so many difficulties insofar as the plastic was concerned. Yet of all the plastic compounds we have tested, including a range of vinyl plastics, only the vinyl chloride-acetate resin VYNW has been able to withstand the constant flexing. There is not much force involved in this flexing, but the repetition is ruinous. Many compounds that from casual inspection appeared suitable would crack completely in two after only 2 or 3 thousand flexes. That's only 2 to 3 miles' walking. Resin VYNW compounds have been developed which will withstand 3 million flexes, or roughly the equivalent of a 3,000 mile hike. In many instances, where transparency is not necessary, the VYNW resin flexible sheeting is backed with a fabric to facilitate fabrication operations and to give added strength.

The ability of the VYNW resin sheeting to withstand continual flexing has also been an important factor in its excellent performance as an upholstering material for planes, tanks, and combat vehicles. To form upholstery material, the compound is calendered onto a suitable fabric



Hospital sheeting for Army medical corps — calender or spreader coated both sides with plasticized Vinylite resin VYNW.

and embossed to give the surface pattern desired. Here again, the fabric plays an important part in facilitating the upholsterer's work and adding to the strength of the finished job. Similar material has also met the Navy's rigid specifications for covering binocular bodies.

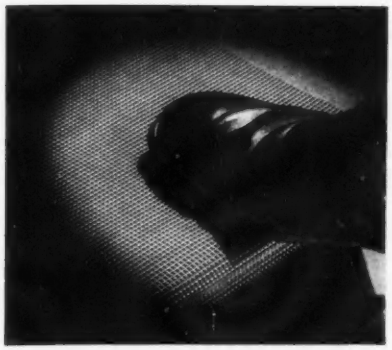
Relatively recently, plastics have gone to the hospital. This isn't as bad as it sounds. When our rubber supply was cut off it became necessary to get an impervious chemically-resistant material to replace the rubber sheeting used to protect hospital bedding. As has happened in numerous cases, the vinyl chloride-acetate resin VYNW used were not a mere replacement but an improvement. As in previously mentioned applications, the fabric interlayer prevents excessive stretching and makes it easier to pull the sheeting from under a patient. In addition to resisting alcohol, steam sterilization, carbolic acid, chlorine type disinfectants, and other corrosive agents encountered, it is also resistant to mineral oil used on certain patients. In addition the coating is non-oxidizing which is practically synonymous with good retention of flexibility and freedom from cracking over a long period of time. The maroon shade blends with the color of dried blood; hence eliminates one obviously disturbing psychological factor in field hospitals.

Vinyl chloride-acetate resin coated textiles also furnish protection to workers in various explosives and chemical plants. Vinyl butyral resin, while not considered in general as being chemically resistant, is however resistant to certain vesicants used in chemical warfare.

About three years ago, the U. S. Army Quartermaster Corps set out to develop a raincoat for our troops that would be second to none. After exhaustive tests, they arrived at a tentative specification which required the water-proof coating for the cloth to withstand temperatures of 250° F. without becoming tacky. Also, at substantial sub-zero temperatures, the coating could not crack

Army raincoat—calender or spreader coated (inside) with plasticized vinyl chloride-acetate resin.

when sharply folded. Obviously, equally stringent specifications on water-proofness and age-resistance were included. Coatings based on vinyl chloride-acetate resin VYNW and vinyl chloride resin of the QYNA type fulfilled the requirements of this rigid specification. As most of you know, production of coats with these high vinyl chloride content resins had hardly got under way when even more vital war uses called for their use in greatly increased quantities. Vinyl chloride-acetate resin of the VYNS type, while not considered as suitable, pinch-hit for the VYNW and QYNA type resins. Even the VYNS resin was closely pressed to carry the load involved in furnishing sufficient material for the number of raincoats required by the Quartermaster Corps. By this time, scientific ingenuity had devised ways to compound or heat harden vinyl butyral resin so as to considerably improve its resistance to water. Since the suspension of automobile production had released quantities of this resin used in laminated safety glass, the vinyl butyral resin was able to carry a portion of the raincoat production load. One of the raw materials involved in producing the vinyl butyral resin also became critical not so long ago, but in the meantime, production of the resins originally chosen for the raincoat job, namely vinyl chloride-acetate resin and vinyl chloride resin, have gained ground so it now appears that the Quartermaster Corps will be back to their first choice. I mention this case history of supply merely to



Bomber floor matting—made by embossing heavy Vinylite resin calender coated cloth.

illustrate the fact that our armed force procurement branches have not only problems of specifications on any given article, but are often confronted with a constantly changing supply situation. With domestically produced synthetic resins of the type involved in this instance, there appears at long last to be some hope for at least a reasonable degree of stabilization.

Other uses for water-and-weather-proofed cloth of this type include airplane cock-pit covers, miscellaneous equipment covers, and lifebuoy covers.

The versatility of the vinyl resins is also shown by their use as the water-proofing and laminating medium for double texture raincoats and ponchos. Another laminating application is their use for bonding cloth to the outer surface of tropical helmets and pulp interliners for steel helmets. These helmets, while obviously designed for use as headgear, are apt to be used to carry water, bail out a raft, and so forth. The tropical sun beating down on them is none too gentle either, so you can readily appreciate the performance expected of the adhesive. These resins are also used to heat-seal monograms, and insignia on to various articles of clothing. Emulsified solutions of the resins have been successfully employed in anchoring the pile of fabric used for floor coverings.

Judging from conversations with various members of the textile industry, there appears to be many other enticing possibilities in the lamination of textiles. As I understand it, the properties of textiles are not automatically doubled when the cloth is doubled. For example, the air permeability of a doubled cloth is not one-half that of the individual layer, but may be as much as two-thirds of the single texture. This should be an important factor in garment comfort. The permeability should also be subject to a degree of control through use of varying amounts and different methods of application of the adhesive. On the other hand, there appears to be some evidence that doubling a given fabric may more than double the wear expected of the original single texture fabric. The doubling of the fabric with an adhesive can conceivably produce a cloth at a cost substantially lower than that involved in weaving it to the desired final total weight. I have encountered figures in the range of $4.50 per yard for 24-30 oz. woolens, whereas figures in the range of $1.00 per yard have been mentioned for 8 to 10 oz. woolen flannel type fabrics. To sum up, the loss of less than one-half of certain properties and the more than doubling of others appears to offer many possibilities for textile lamination.

The vinyl chloride-acetate resins have, in addition, shown valuable properties as an adjunct to water-repellent treatments used on textiles for rain- and sports-wear. With a straight water-repellent treatment, there is a limit to the size of the interstices in the cloth that can be tolerated in producing a suitably water-resistant fabric. Decreasing the size of the interstices by application of a light coating of vinyl chloride-acetate resin has permitted the production of a fabric which will withstand 50 cms. of water pressure for 1 hour with no leakage. Since the interstices are not necessarily completely closed, or if closed, only by an extremely thin resin film, the resultant fabric will still permit passage of approximately 2 ozs. of water vapor per square yard per hour. This appears to be a factor in increasing comfort of a garment as compared to a relatively completely impermeable water-proofing coating. Since the coating is applied on the reverse side, the appearance of the exterior of the fabric is unchanged. This, you can readily appreciate, represents a decided advantage in retention of style-appeal.

Following is a brief review of the applications just mentioned (Table II):

TABLE II
Applications

An Outstanding Property of the "Vinylite" Resin Involved	*Applications Described*	*Approximate Ratio of Textile Weight to the Weight of "Vinylite" Resin Compound Present*
1. Chemical resistance	Hospital sheeting, protective clothing	1 to 3
2. Flex or fatigue resistance	Upholstery, shoe uppers	1 to 3
3. Abrasion resistance	Pontoons, shoe-tipping	1 to 2
4. Low temperature flexibility	Aircraft paulins	1½ to 1
5. Water and weather resistance	Raincoats, cock-pit covers.	1 to 1
6. Lack of taste, odor and toxicity	Food bags, water bags	1 or 2 to 1
7. Flame-proofness	Truck covers, tarpaulins	2 or 3 to 1
8. Dimensional stability	Navigating instruments	.....
9. Weather resistance and style retention	Rain and sports wear	8 or 10 to 1
10. Adhesion	Laminated raincoats, pile bonding	1½ to 1 12 to 1

In column number one of the table, a wide range of desirable properties is evident. In column three, you will note the weight relationships of textiles and vinyl resin

(Concluded on Page P133)

PHENOL RESINS AND RESIN EMULSIONS

and their Application to Textiles*

W. H. BUTLER

Development Laboratories, Bakelite Corporation

AMONG textile chemists generally, application of phenol resins to textiles is less widely known than that of certain other resin polymers, most familiar of which are the water-soluble types commonly used for sizing or stiffening fabrics. Nevertheless, phenolic resins are extensively employed in connection with fabrics for a number of important industrial applications. For example, phenolic resins are used in considerable volume in production of laminated fabrics, fabric-filled molded articles, and for bonding and insulating fabric-wrapped and cotton-covered conductors for electrical apparatus. Standard grades of sized or unsized textiles are chiefly used in these applications, exceptions being cable and empire cloth, generally referred to as varnished cambric.

A relatively new development, covered herein, is application of resin emulsions. This will be of particular interest to textile mill departments and companies concerned with fabric finishing.

Doubtless many people will read this article who are already well posted on the chemistry of phenolic resins, but for those who are not a few remarks and diagrams designed to illustrate this phase of the subject may be helpful.

CHEMISTRY OF PHENOLIC RESINS

Commercial production of phenolic resin plastics was first successfully developed by Dr. L. H. Baekeland, who announced his discovery in 1909. The phenol-formaldehyde reaction was known prior to that time, but it was Dr. Baekeland who brought this reaction under control, permitting production of heat-setting phenolic resin compounds capable of being put to practical use with good uniform results.

Figure I shows the reaction of phenol and formaldehyde, the primary condensation product, and the mechanism of polymerization.

From this apparently simple reaction it is possible to obtain a wide range of complex resinous materials. In practice the resin chemist produces specific resins "tailored" to meet specified industrial requirements.

Table I lists general types of phenolic resins and resinous solutions available and indicates their respective specific applications with textiles.

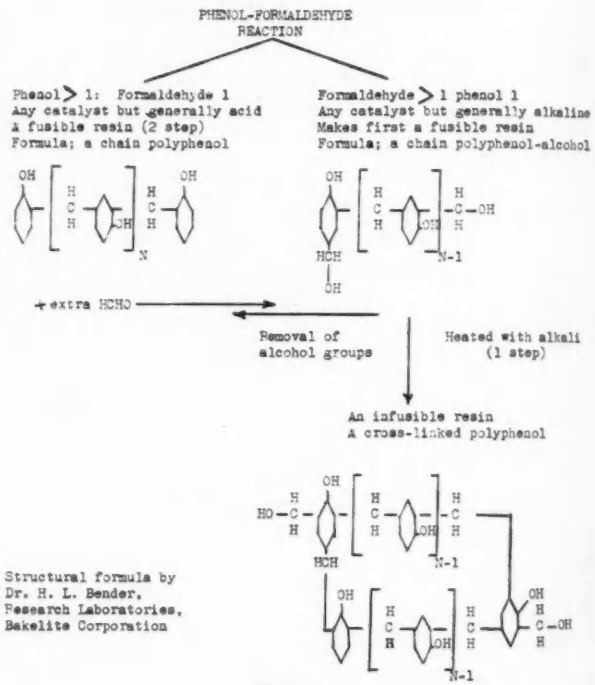

PHENOL-FORMALDEHYDE REACTION
Phenol > 1: Formaldehyde 1
Any catalyst but generally acid
A fusible resin (2 step)
Formula; a chain polyphenol
Formaldehyde > 1 phenol 1
Any catalyst but generally alkaline
Makes first a fusible resin
Formula; a chain polyphenol-alcohol
+ extra HCHO
Removal of alcohol groups
Heated with alkali (1 step)
An infusible resin
A cross-linked polyphenol
Structural formula by Dr. H. L. Bender, Research Laboratories, Bakelite Corporation

Figure 1

The large and growing use of phenolic resins with textiles in laminated and molded plastics is based on two fundamental properties (1) the chemical inertness, stability, and high tensile strength of the thermosetting phenolic resins; and (2) the high impact strength and increased tensile and flexural strengths imparted by the textile component.

The nature of the textile material used—fabric, felt, or fiber—greatly affects the final properties of the finished laminated material or molded product. Sizing of woven fabric tends to reduce penetration by the resin, resulting in increased impact strength but lower tensile strength. The selection of fabric, phenol resin, and the method of processing are based on experience and highly developed coordination of the resin chemist and the application specialist, with the aid of a physical testing laboratory.

LAMINATED AND MOLDING MATERIALS

Punch stock, electrical insulation, table tops, safety

* Presented at meeting, New York Section, January 29, 1943.

TABLE I

Classification of Phenolic Resins and Their Use in Textiles

Type	*"Typical" Bakelite* Product*	*Application with Textiles (Phenolic Resin Laminated and Molded Resin-bonded Textiles)*
1 *step type* Water soluble condensation product. Reducible with water and alcohol for application.	BR-15100	For stabilizing dimension, as a saturant, or blending with 1 or 2 step type phenolics to impart dimensional stability, rigidity, fast cure and chemical resistance. For use in production of chemical resistant phenol resin laminated textile.
1 *step type* Reducible with alcohol for application, medium to fast heat convertible type.	BV-1680	Use. For laminated fabric sheets, for bearings, and gear stock. For thick walled tubes and molded rods. Good stability on aging and on exposure to stress, and wear resistant.
1 *step type* Reduced with alcohol for application. Fast heat convertible type.	BV-16238	Use. For low pressure molding at pressures as low as 50 lb. per sq. in. For antenna masts, aircraft, etc.
2 *step type* Made heat convertible by addition of Bakelite hardener solution, BK-15969. Reducible with alcohol. Rigid type, fast curing with hardener.	BV-5954	Use. For shredded textile molding material, shock resistant type.
1 *step type* Soluble in alcohol and aromatic solvents for application. Slower curing type.	BV-914	For laminated fabric, for electrical application, punch stock, etc. Improved arc resistance.
Heat setting type. Fast curing.	BM-3510	Fabric molding compound for high impact, for instrument cases, fire extinguisher tubes, oil well drilling parts and insulation blocks. Good electrical properties.

Type	*"Typical" Bakelite Product*	*Application with Textiles (Calendering Masses for Textiles)*
Flexible phenol tung oil reaction product. Supplied as a viscous gelled mass. Heat convertible.	XK-6815	For calendering onto fabrics, for laundry rolls, weather resistant tape, pressure sensitive adhesives, and chemical resistant coated fabric. Yields excellent shelf life with rubber base adhesive.
Flexible, synthetic polymer containing phenolic resin. Heat convertible.	XK-16315	For calendering on fabric base, for uses where paler color and greater film strength are required than is obtainable with XK-6815.

For classification of Bakelite "C-9" resins refer to the bulletin entitled, "Bakelite 'C-9' Resins," and for technical data on resin emulsions refer to the booklet, "Bakelite Coating Products, Water Emulsions Based on 'C-9' Resins."

*"Bakelite" is a registered trade-mark of Bakelite Corporation, Unit of Union Carbide and Carbon Corporation.

helmets, bearings, gear stock, and structural parts for airplanes, and various types of apparatus are typical applications for which fabrics laminated with phenolic resins are used. Principal steps in making these materials are: (1) controlled saturation of the fabric with the phenolic resin varnish; (2) controlled drying to obtain correct volatile content; and (3) lamination, which is accomplished by stacking the treated fabric in a press and polymerizing the resin binder under heat and pressure.

Molding compounds of high impact and tensile strength are produced by saturating suitable fabric with phenolic resin, or by using the fabric, or fiber, as a filler. If fabric is used the treated material is cut into small pieces, so the mold can be filled, is subjected to heat and pressure in the molding operation, and is then ejected as a completed molded part or product.

CALENDERED COATINGS

Chemical-resistant fabrics are made by hot-calendering flexible, heat-convertible, phenolic-gelled masses on the fabric, after which the latter is subjected to a high temperature for a time ranging from 30 seconds to 5 minutes. Fabric so treated is used as material for weather-resistant tape, hospital sheeting, laundry roll covers, backing for surgical tape, industrial pressure-sensitive adhesives, and, in general, any application requiring heat stability and chemical inertness not obtainable in conventional coated fabrics.

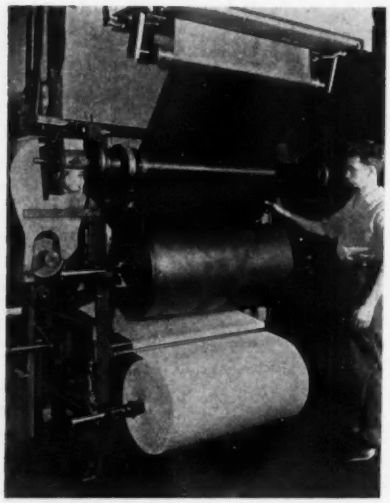
EMPIRE AND CABLE CLOTH

Empire and cable cloth, often referred to as varnished cambric, is used for insulating electrical conductors, cables, motors, and other applications requiring greater insulating protection than is obtainable with thin coatings. It is usually used in the form of tape, which is wound on the conductors in fabricating and installing electrical cables and apparatus. Requirements for this product are very severe, and only a few fabrics are satisfactory for this use. The closest collaboration is necessary between the textile chemist and the insulating varnish specialist. The reason for this will be evident in the following brief specifications:

> "Cable cloth or tape must withstand a minimum of 300 hours baking at 125 deg. C. without cracking. The dielectric strength should be 1050 volts per mil by the I.P.C.E.A. method. It must have a low power factor and a low loss factor. It should be very flexible, with high tear strength, and controlled elongation."

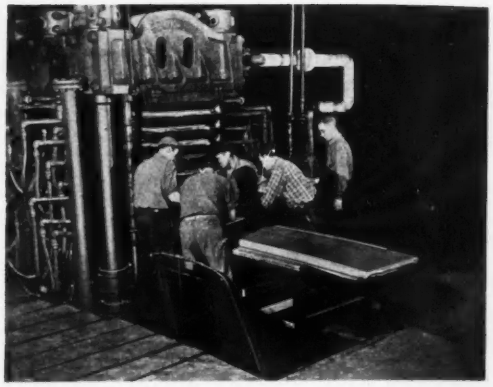
This insulating material is usually supplied in thicknesses of 5, 7, 10, and 12 mil. Flexible phenolic resins are used quite universally in making varnished cambric, permitting utilization of domestic raw materials in manufacture of this product. Advantages of the flexible phenolic resins for this application are low power factor with decreasing power factor on increasing temperature from 25 to 100 deg. C., high heat and aging stability, and chemical inertness to greases, lubricants, and oxygen.

Flexible phenolic resin films on metal, having a power factor of 1.5-2.0 per cent at 80 deg. C., can be duplicated on high-grade cambric, but we have tested a number of grades of cloth which raised this power factor to 6 to 8



Rolls of paper or fabric are impregnated as they pass through a bath of laminating varnish. These varnish-laden sheets then pass to a dryer where the solvent is evaporated.

LEFT—After impregnation the sheets are cut to a convenient size, then stacked to predetermined thickness. Next, polished metal press plates are placed at both top and bottom of each of these packs.



RIGHT — Layers of sheets are placed between heated platens of hydraulic presses until a hard, rigid plate is produced. The pile of resinoid-impregnated layers is thus transformed into an infusible, insoluble sheet which will not delaminate, cannot be resoftened by heat, is non-hygroscopic, and possesses high mechanical strength.

per cent. The inorganic salts, either from the bleaching operation or sizing, which remain in the cloth will impair the electrical characteristics of the coated cloth, and for this reason the ash content must be very low. Wide variations in tear strength and elongation are noted with different grades of cloth. Cotton fabric is now used for the bulk of production, but there will be an increasing use of synthetic textile fibers and glass cloth. Glass cloth is especially advantageous with respect to heat resistance, and identical flexible phenol resin coatings yielding heat resistance of 800 hours at 125 deg. C. on cotton cambric will show no failure on glass cloth over a period of 3,500 hours, or longer, at 125 deg. C. The major objection to cotton fabric is the decrease in electrical properties when the insulating tape is subjected to moisture. More extensive work on saturation and sizing may help to overcome this defect. Annual consumption of fabric for varnished cambric is approximately 40 million yards.

APPLICATION OF RESIN EMULSIONS TO TEXTILES

Resin emulsions are based on dispersions of suitable resin in water. The dispersions may be either the oil-in-water type or the water-in-oil type. The base vehicle may or may not contain solvent, although the solvent-free type is preferable. The dispersions are obtained with the use of emulsifying agents, such as the volatile amine soaps, and are then stabilized with water-soluble colloids as required.

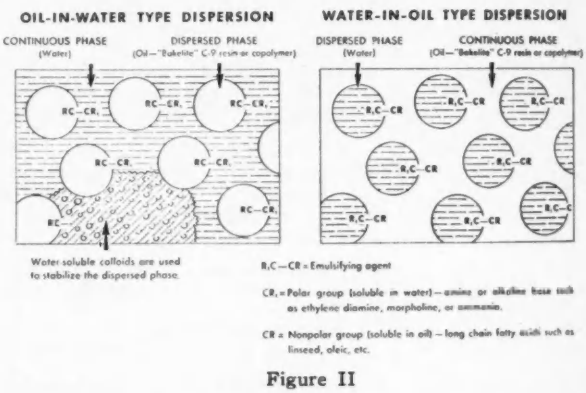

OIL-IN-WATER TYPE DISPERSION
CONTINUOUS PHASE
(Water)
DISPERSED PHASE
(Oil—"Bakelite" C-9 resin or copolymer)
R.C—CR
Water soluble colloids are used to stabilize the dispersed phase.
WATER-IN-OIL TYPE DISPERSION
DISPERSED PHASE
(Water)
CONTINUOUS PHASE
(Oil—"Bakelite" C-9 resin or copolymer)
R.C—CR
R.C—CR = Emulsifying agent
CR = Polar group (soluble in water) — amine or alkaline base such as ethylene diamine, morpholine, or ammonia.
CR = Nonpolar group (soluble in oil) — long chain fatty acids such as linseed, oleic, etc.

Figure II

Types of dispersion and components required for film-forming coatings based on Bakelite C-9 resins are indicated in Figure II.

Resin emulsions are essentially a two-phase system, one phase being dispersed with the other phase remaining insoluble in the dispersed phase. An indication of the large surface area obtained when a substance is divided into a particle size approaching an oil-in-water type dispersion is indicated by Table II.

It will be noted that when one cubic centimeter of substance is reduced to a number of smaller cubes, 0.1 mm. and 0.01 mm., the total surface resulting from this division

TABLE II

From "Colloidal Aspects of Dispersions as Applied to Paint and Varnish" by R. J. Moore

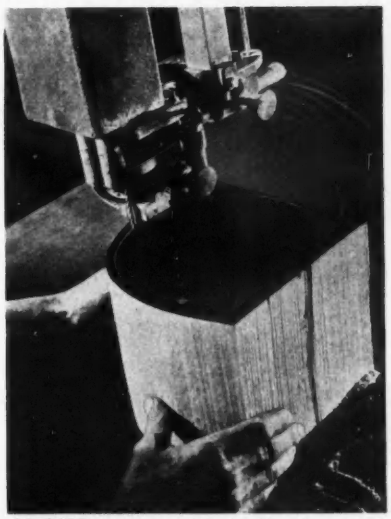
Length of Sides	*No. of Cubes*	*Total Surface*	*Specific Surface (Surface Divided By Volume)*	
1 cm.	1	6 sq. cm.	6	
1 mm. (10^{-1})	1,000	60 sq. cm.	6 x 10	
0.1 mm. (10^{-2})	1,000,000	600 sq. cm.	6 x 10^2	Ordinary Suspensions and Emulsions
0.01 mm. (10^{-3})	1 billion	6,000 sq. cm.	6 x 10^3	Size of Cream Globules
1 mu (μ) (10^{-4})	1 trillion	60,000 sq. cm.	6 x 10^4	Slight Brownian Movement
0.1 mu (10^{-5})	10^{15}	60 sq. meters	6 x 10^5	Limit of Microscope Well Defined Tyndall Effect
0.01 mu (10^{-6})	10^{18}	600 sq. meters	6 x 10^6	Typical Colloidal Solutions Hemoglobin Molecule
1 double mu (1 x 10^{-7} cm.)	10^{21}	6,000 sq. meters	6 x 10^7	
0.1 double mu (10^{-8} = 1A)	10^{24}	60,000 sq. meters	6 x 10^8	Atomic Dimensions

is increased to 600 and 6,000 sq. cm., and the number of particles from 1 to 1,000,000 and from 1 to 1,000,000,000, respectively. Oil-in-water type dispersions range in this region of particle size.

The importance of having this large contact area is demonstrated in the production of high polymers by emulsion polymerization. In processes of this type monomers are dispersed in an aqueous medium, and catalysts are added to the water phase as hydrogen peroxide, benzoyl peroxide, or other activating catalysts. Rubber latex is one example of a natural high-polymer dispersion of the oil-in-water type.

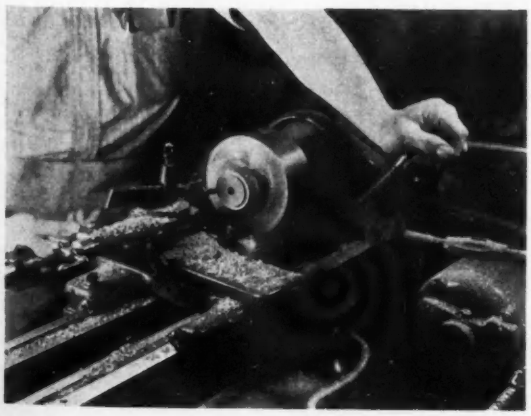
With present conditions in the United States accelerating development and production of high polymers there will, no doubt, be available in future a wide range of stable dispersions of the high polymers in water which should increase application of these products. Already, however,

ABOVE—Here a workman molds an irregularly shaped insulator. The machinability of these plastics is excellent. They may, when desired, be tapped, threaded, and rolled.

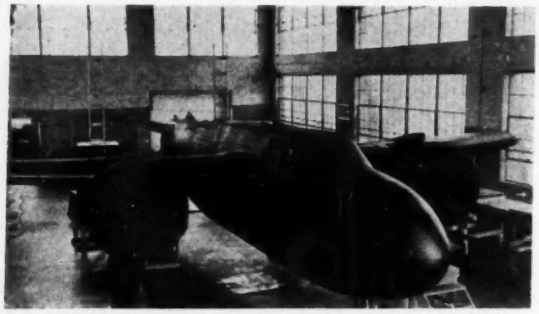


ABOVE—A gear blank disc is sawed from sheet stock on a band saw. Laminated plastics can likewise be drilled and punched, either hot or cold, according to the grade.

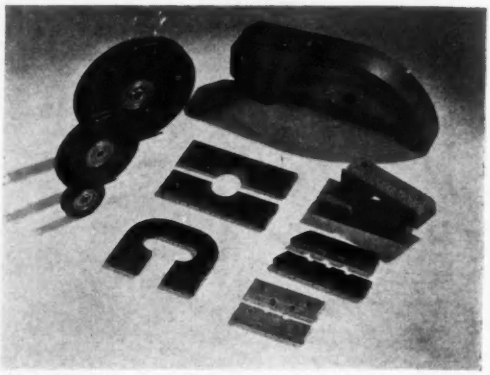
BELOW—Laminated stock is turned easily and accurately on modern tool machines.



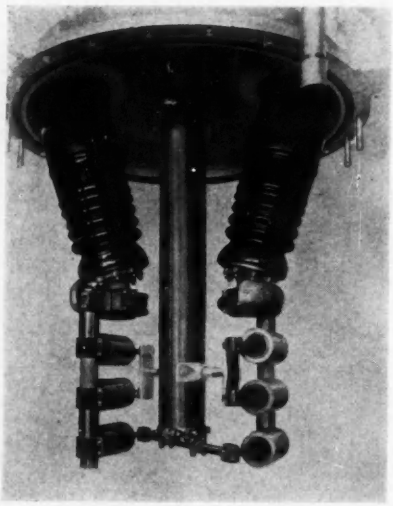
BELOW—A workman is shown turning, boring, and cutting a segment from a large fabric-base laminated tube.

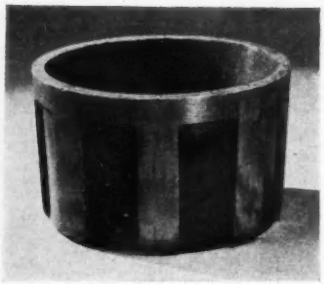


This bomber is completely wrapped with tape made from "Revolite" coated fabric which is a product of the Zapon Division of the Atlas Powder Co. The fabric is roll-coated with a special type of Bakelite phenolic calendering resin and provides protection against the weather in transit.



Aircraft pulleys, various types of fairleads, propeller supports, and cabin air controls made from laminated plastics.





ABOVE—Plastic spinning pot.

RIGHT—Laminated plastic explosive containers for use in shooting oil, gas, or water wells with explosives.

LEFT—Oil circuit breaker has plastic spindler and expulsion chamber sleeves.

there are such stable dispersions, an example of which is the dispersion of Bakelite C-9 resins in water, which yield heat-convertible, flexible films applicable to cloth, yielding a non-penetrating surface coating. This coating is especially useful as a barrier coat for application of other surface coats containing solvents.

Application of resin emulsions to textiles can be readily handled by textile mill finishing departments and finishing companies, as these emulsions can be made free of solvents and their application, at least in part, can be effected by utilizing equipment usually available in the mills.

Preferably resin emulsions should be applied by knife coating and then run through a tenter-frame and drier, rather than by the dip and wringing process. Unfortunately, most cloth coaters have knife-coating apparatus but do not have tenter-frames; whereas the finishing mills have tenter-frames and driers, but do not have apparatus for knife coating. For some uses satisfactory results are obtained by saturation, especially where improved moisture resistance or tensile strength is required. The major advantage of resin emulsions, however, when properly formulated and applied by knife coating, is the ease with which they can be laid on the surface of the fabric, yielding a continuous waterproof film while retaining the limpness and hand of the fabric.

Resin emulsion coated cloth also makes an excellent base of barrier coat for subsequent coating with solvent bearing lacquers, varnishes, and high molecular weight linear polymers. The continuous film of resin emulsion prevents saturation of the fabric and makes it possible to utilize a wide variety of finishing coats.

USES AND CHARACTERISTICS OF RESIN EMULSIONS

Resin emulsions are now being used extensively for protective and camouflage, as well as decorative coatings, and this development has been accelerated due to war requirements. It is considered, however, that when war restrictions are removed, so that these materials, now vital for defense, are available for civilian use their applications will be even more numerous and extensive. This interest in, and utilization of, resin emulsions is generated by their extraordinary film integrity and water resistance, ease

of application, and elimination of solvent hazards. The remarkable durability of resin emulsion paints is indicated by results of tests made with such paints based on Bakelite C-9 resins. Coatings exposed for 2,000 hours in the National Carbon Company's "National" Accelerated Weathering Machine showed only slight chalking. Coatings after air-drying five days, followed by five days of soaking in water, showed little or no wear when scrubbed for 10,000 complete oscillations with a wet scrubbing brush weighted with a one-pound weight.

In conclusion, we can state our confidence that experience in developing new products and applications to meet war requirements will be effectively utilized in adapting these products to many important civilian uses when the present war is terminated. Among these products and their fields of service will be extensive application of phenolic resins and resin emulsions in combination with textiles.

Vinyl Resins—

(Concluded from Page P127)

compounds in various items varies from a low of one part textile to 3 parts vinyl resin compound—to a high of roughly 12 times as much textile material as vinyl resin compound. Referring back to our original consideration of the future of vinyl resins in the textile field, I will not venture to say at this time just how much future developments will enlarge the range of these relationships. However, investigations are under way which, if completed to our satisfaction, will still further widen the horizon.

I believe I am also safe in saying that many of you here tonight will be intimately connected with the future of textiles and vinyl resins. In the meantime, the present status of the "textile-vinyl resin art" appears to offer ample freedom for the exercise of individual ingenuity in developing an increasing number of items useful to our war effort. And, if it is not too much to hope for at this time, items useful in future world commerce.

REPORT, LOWELL TEXTILE INSTITUTE STUDENT CHAPTER

ON February 18, 1943, officers were elected because of the departure of Chairman Malcolm P. Coulman for the Army Air Corps. Carmelo R. Puliafico was elected Chairman, and Paul J. Martin, Secretary.

Respectfully submitted,

RALPH L. BULLOCK, *Secretary.*

REPORT, NORTH CAROLINA STATE COLLEGE STUDENT CHAPTER

THE North Carolina State College Student Chapter recently heard three lectures by Reid Tull of Arnold Hoffman & Co., who received his B.S. from the College in 1933, and for a number of years worked in a rayon finishing plant. He discussed finishing, including Sanforizing, the newer resin compounds, and various types of machinery; and answered the many questions which followed.

Respectfully submitted,

JAMES F. MCALISTER, *Secretary.*

MEETING, PHILADELPHIA SECTION

A MEETING was held on March 5, 1943 of the Philadelphia Section at the Hotel Philadelphian. There were 74 members present at this meeting.

A short technical address was given by Dr. George P. Vincent of the Mathieson Alkali Works Inc. citing the economic and practical use of Textone (Sodium Chlorite) in vat dyeing. A discussion on the use of this product in vat dyeing was held by the members and Dr. Vincent after his short address.

A talk was also given by Joseph A. Wilson, Chief of Income Tax, U. S. Dept. Internal Revenue, on "Income Tax in its relation to the Textile Technician." He discussed the personal problems confronting each individual in the making up of his income tax returns on March 15th. This came at a very opportune time, as each member welcomed his advice, as it cleared up some of the confusion which existed on this subject.

Respectfully submitted,

BOYCE C. BOND, *Secretary.*

MEETING, NEW YORK SECTION

A MEETING of the New York Section was held on March 5th at the Downtown Athletic Club, in New York City, at 8 P.M. Preceding the meeting an informal dinner was served.

The chairman announced the appointment of Henry F. Herrmann as chairman of the nominating committee. This committee will report at the next meeting.

The chairman of the technical program committee referred to the next meeting, plans for which are underway, and emphasized the necessity for returning reservation cards in order that adequate dinner arrangements could be made.

Speakers at the meeting were: Clark Heydon, superintendent of dyeing and finishing, United Piece Dye Works, who spoke on "Processing of Synthetic Textile Fabrics" and Dr. Hugh H. Mosher, director of textile research, Onyx Oil & Chemical Co., who spoke on "Chemical Finishes for Rayon Fabrics".

The attendance was approximately 200.

Respectfully submitted,

NORMAN A. JOHNSON, *Secretary.*

CALENDAR OF COMING EVENTS

Meeting, New York Section, Downtown Athletic Club, New York City, April 16, 1943.

Meeting, Philadelphia Section, April 30, 1943.

Meeting, Northern New England Section, April 16, 1943. General Business Meeting (in conjunction with New York Section meeting) April 16, 1943, New York City.

Council and Research Committee Meetings, April 17, 1943, New York City.

Meeting, Southeastern Section, Atlanta Athletic Club, Atlanta, Ga., April 17, 1943.

Meeting, Piedmont Section, Greensboro, N. C., June 5, 1943.

APPLICATION BLANKS

for Individual

and Corporate

MEMBERSHIP

may be obtained from

the Secretary

Dr. H. C. Chapin, Lowell Textile Institute, Lowell, Mass.

WASHING IN HARD WATER

(Continued from Page 122)

water with or without soap changed little in total sulfur or sulfate (Table X).

The drying effect on wool of repeated washing with soap is shown in Table XI.

Only in the felting of wool dried without stretching did the aryl sulfonate in hard water alter any of the six textiles more than these cloths were changed by washing in hard water alone.

EXPERIMENTAL PROCEDURE

Preparation of Fabrics

The bleached plain-woven spun cellulose-acetate rayon, cotton muslin sheeting, linen handkerchief sheer, and spun regenerated-cellulose rayon, the silk crepe and the undyed wool twill were cut with pinking shears into lengths approximately one square yard in area. A mark showing the treatment planned for each cellulosic cloth was stitched into a corner of it with cotton thread; the silk was stitched with silk thread and the wool with wool yarn.

Washing and Rinsing of Fabrics

1. *With hard water.* Each cloth was washed separately and gently by hand for four minutes in fifty volumes (a volume in milliliters fifty times the number of grams the original cloth weighed) of hard water at an initial temperature of 40°C. in a white porcelain pan, lightly squeezed, and transferred to another fifty-volume bath of hard water at an initial temperature of 40°C. for a four-minute rinse;

TABLE II
Absorption of light by washed fabric

Fabric	*Washing number*	*Water percentage*	*Aryl sulfonate percentage*	*Soap percentage*
1. Cellulose-acetate rayon.	0	16.0(0.0)*	16.0(0.0)	16.0(0.0)
	1	16.0(0.0)	14.7(0.2)	15.0(0.8)
	10	14.4(0.2)	14.8(0.5)	15.3(0.8)
	20	14.1(0.5)	14.2(0.8)	15.0(0.8)
	30	14.5(0.6)	14.9(0.5)	15.4(0.5)
	40	14.5(0.0)	14.5(0.0)	15.0(0.6)
	50	15.3(0.6)	15.0(0.4)	14.4(0.4)
2. Cotton	0	8.1(0.7)	8.1(0.7)	8.1(0.7)
	1	7.3(0.6)	7.3(0.2)	8.2(0.4)
	10	8.0(0.2)	8.1(0.3)	6.0(0.3)
	20	9.1(0.3)	8.5(0.0)	5.9(0.5)
	30	9.3(0.2)	8.5(0.0)	6.4(0.2)
	40	9.3(0.2)	8.6(0.2)	5.8(0.4)
	50	9.4(0.2)	8.6(0.2)	5.1(0.3)
3. Linen	0	7.6(0.4)	7.6(0.4)	7.6(0.4)
	1	7.2(0.4)	4.6(0.2)	5.9(0.3)
	10	4.7(0.6)	4.2(0.2)	4.6(0.2)
	20	4.3(0.4)	4.9(0.2)	3.8(0.2)
	30	4.2(0.2)	4.8(0.2)	3.7(0.4)
	40	4.2(0.4)	4.3(0.4)	3.7(0.4)
	50	4.1(0.3)	6.0(0.4)	3.5(0.2)
4. Regenerated-celluose rayon	0	12.1(0.3)	12.1(0.3)	12.1(0.3)
	1	12.1(0.5)	12.4(0.2)	12.5(0.0)
	10	12.3(0.2)	12.3(0.5)	9.7(1.0)
	20	12.1(0.3)	11.6(0.2)	10.2(0.2)
	30	11.9(0.2)	11.3(0.2)	9.9(0.2)
	40	11.6(0.2)	11.5(0.0)	9.5(0.4)
	50	11.3(0.2)	11.2(0.7)	8.8(0.4)
5. Silk	0	16.0(0.4)	16.0(0.4)	16.0(0.4)
	1	17.3(0.2)	17.9(0.3)	17.7(0.2)
	10	17.3(0.2)	18.0(0.2)	12.8(0.4)
	20	17.3(0.4)	19.2(0.4)	11.8(0.2)
	30	17.0(0.2)	18.2(0.4)	7.9(0.5)
	40	17.4(0.3)	18.0(0.6)	9.6(0.5)
	50	17.9(0.5)	18.5(0.4)	8.6(0.2)
6. Wool	0	29.8(0.8)	29.8(0.8)	29.8(0.8)
	1	30.6(0.6)	32.1(0.3)	35.4(0.2)
	10	34.5(0.2)	30.2(0.6)	26.1(1.1)
	20	33.5(0.6)	30.8(0.4)	26.0(0.6)
	30	32.8(1.5)	28.9(0.8)	23.3(1.0)
	40	34.6(1.7)	29.7(1.2)	22.7(0.6)
	50	33.8(0.3)	29.4(1.1)	21.9(0.5)

*Mean deviations are within parentheses.

TABLE III
Ash of washed fabric

Fabric	*Washing number*	*Water percentage of washed fabric*	*Aryl sulfonate percentage of washed fabric*	*Soap percentage of washed fabric*
1. Cellulose-acetate rayon.	0	1.61(0.00)*	1.61(0.00)	1.61(0.00)
	1	1.66(0.01)	1.65(0.01)	1.68(0.01)
	10	1.67(0.01)	1.67(0.00)	1.71(0.02)
	20	1.74(0.01)	1.72(0.02)	1.72(0.01)
	30	1.78(0.01)	1.79(0.02)	1.75(0.01)
	40	1.83(0.02)	1.79(0.02)	1.81(0.02)
	50	1.84(0.01)	1.81(0.02)	1.93(0.01)
2. Cotton	0	0.03(0.01)	0.03(0.01)	0.03(0.01)
	1	0.08(0.01)	0.11(0.00)	0.14(0.01)
	10	0.23(0.01)	0.23(0.01)	0.45(0.01)
	20	0.34(0.01)	0.35(0.01)	0.66(0.02)
	30	0.49(0.04)	0.44(0.01)	0.88(0.04)
	40	0.62(0.00)	0.50(0.01)	1.14(0.05)
	50	0.71(0.01)	0.56(0.01)	1.41(0.09)
3. Linen	0	0.08(0.01)	0.08(0.01)	0.08(0.01)
	1	0.11(0.01)	0.07(0.01)	0.28(0.01)
	10	0.23(0.01)	0.22(0.02)	0.40(0.01)
	20	0.41(0.01)	0.26(0.01)	0.62(0.01)
	30	0.57(0.01)	0.44(0.02)	0.79(0.02)
	40	0.81(0.01)	0.35(0.01)	1.08 0.01)
	50	0.87(0.00)	0.33(0.02)	1.25(0.05)
4. Regenerated-cellulose rayon	0	0.25(0.01)	0.25(0.01)	0.25(0.01)
	1	0.23(0.00)	0.25(0.00)	0.26(0.00)
	10	0.38(0.01)	0.45(0.02)	0.48(0.03)
	20	0.46(0.01)	0.67(0.02)	0.62(0.02)
	30	0.56(0.01)	0.75(0.03)	0.73(0.03)
	40	0.75(0.01)	0.85(0.04)	0.85(0.01)
	50	0.87(0.02)	1.08(0.02)	1.04(0.04)
5 Silk	0	2.09(0.03)	2.09(0.03)	2.09(0.03)
	1	2.17(0.00)	2.11(0.04)	1.07(0.02)
	10	1.99(0.00)	2.55(0.08)	2.05(0.01)
	20	1.82(0.02)	3.08(0.03)	2.10(0.00)
	30	1.82(0.02)	3.09(0.17)	2.84(0.01)
	40	1.76(0.02)	3.09(0.02)	3.33(0.04)
	50	1.79(0.01)	3.23(0.01)	4.28(0.04)
6. Wool	0	0.76(0.01)	0.76(0.01)	0.76(0.01)
	1	0.71(0.04)	0.75(0.04)	1.05(0.06)
	10	0.85(0.03)	1.22(0.04)	2.50(0.01)
	20	0.89(0.01)	1.34(0.01)	3.05(0.03)
	30	0.93(0.06)	1.50(0.01)	3.82(0.08)
	40	0.93(0.03)	1.96(0.02)	3.68(0.08)
	50	0.92(0.03)	2.29(0.01)	4.51(0.03)

*Mean deviations are within parentheses.

TABLE IV
Distribution of yarns by weight in washed fabric.

Fabric	*Washing*	*Water*	*Warp Aryl sulfonate*	*Soap*	*Water*	*Filling Aryl sulfonate*	*Soap*
	number	*percentage of fabric*	*percentage of fabric*	*percentage of fabric*	*percentage of fabric*	*percentage of fabric*	*percentage of fabric*
1. Cellulose-acetate rayon	0	43.6(0.5*)	43.6(0.5)	43.6(0.5)	56.2(0.5)	56.2(0.5)	56.2(0.5)
	1	45.0(0.5)	44.5(0.1)	44.0(0.1)	54.1(0.2)	55.0(0.3)	55.3(0.2)
	30	44.5(0.1)	43.2(0.4)	43.7(0.5)	54.7(0.2)	55.7(0.5)	56.9(1.2)
	50	44.2(0.3)	45.3(0.1)	43.4(0.3)	55.2(0.4)	54.3(0.3)	55.5(0.5)
2. Cotton	0	48.5(0.1)	48.5(0.1)	48.5(0.1)	51.1(0.4)	51.1(0.4)	51.1(0.4)
	1	49.8(0.3)	50.5(0.4)	49.2(0.4)	49.8(0.3)	48.6(0.1)	50.1(0.3)
	30	50.1(0.2)	49.1(0.2)	49.6(0.2)	49.0(0.4)	50.4(0.2)	49.6(0.2)
	50	49.8(0.6)	49.7(0.3)	50.1(0.1)	49.6(0.2)	49.2(0.2)	49.0(0.1)
3. Linen	0	59.1(0.3)	59.1(0.3)	59.1(0.3)	40.9(0.5)	40.9(0.5)	40.9(0.5)
	1	57.2(0.2)	60.5(0.1)	57.3(0.6)	42.9(0.9)	38.9(0.5)	40.8(0.5)
	30	60.7(0.1)	61.4(0.3)	58.6(0.4)	38.5(0.1)	38.3(0.2)	40.8(0.3)
	50	60.1(0.3)	56.8(0.7)	57.6(0.3)	39.8(0.7)	42.3(0.6)	41.3(0.1)
4. Regenerated-cellulose rayon	0	55.6(0.2)	55.6(0.2)	55.6(0.2)	44.4(0.2)	44.4(0.2)	44.4(0.2)
	1	56.4(0.3)	55.1(0.3)	55.9(0.5)	42.9(0.3)	44.3(0.5)	43.4(0.3)
	30	55.9(0.1)	55.7(0.2)	55.9(0.4)	43.0(0.3)	43.8(0.2)	43.2(0.3)
	50	55.6(0.3)	55.9(0.3)	56.4(0.4)	43.4(0.3)	42.7(0.5)	43.3(0.2)
5. Silk	0	56.0(0.7)	56.0(0.7)	56.2(0.7)	44.0(0.7)	44.0(0.7)	44.0(0.7)
	1	54.6(0.4)	53.9(0.2)	54.2(0.0)	44.1(0.9)	45.9(0.1)	45.2(0.6)
	30	55.0(1.4)	52.7(1.0)	49.9(0.4)	45.1(1.4)	47.0(1.4)	48.0(0.3)
	50	53.0(0.4)	53.2(0.3)	47.1(0.0)	46.8(0.2)	46.5(0.3)	48.6(0.1)
6. Wool	0	36.4(0.2)	36.4(0.2)	36.4(0.2)	62.8(0.1)	62.8(0.1)	62.8(0.1)
	1	35.7(0.3)	35.8(0.6)	34.4(0.2)	63.1(0.3)	63.3(0.6)	63.8(0.0)
	30	32.8(0.6)	**	36.1(0.2)	65.3(0.6)	**	61.4(0.2)
	50	**	**	36.2(0.2)	**	**	61.6(0.3)

* Mean deviations are within parentheses.
** The yarns of these felted wools could not be separated for weighing.

this rinsing was repeated three times before the cloth was hung without pinning over a scoured and wrapped rope and dried in still air and diffused light at room temperature (June 1 to Aug. 15) before the next washing. A short stitch was made in the dried cloth as a record of the washing. Drop in temperature of a bath during the four minutes of washing or rinsing varied from 0.5 to 3.5°C. according to the total volume of the bath.

2. *With the sodium aryl sulfonate.* Each cloth was washed, rinsed, dried, and marked as described for hard water but with substitution of a fifty-volume bath of 0.2 per cent aryl sulfonate in hard water (a volume in milliliters fifty times the number of grams the original cloth weighed and containing 2 g. of air-dry detergent per liter of solution) for the four-minute washing.

3. *With the sodium soap.* Each cloth was washed, rinsed, dried, and marked as described for hard water but with a washing bath of fifty volumes of 0.5 per cent soap in hard water (a volume in milliliters fifty times the number of grams the original cloth weighed and containing 5 g. of air-dry soap per liter of solution). The seventeenth washing of the cotton muslin sheeting which was to have been washed fifty times with soap was accidentally done with aryl sulfonate.

Analysis of the Hard Water

The hard water used for washing and rinsing was the tap water of the laboratory, raw well water treated with lime before settling and filtration. Since this water was known to be quite constant in composition but one sample of it was analyzed. The aluminum (none, 1f), calcium (114±1 ppm, 1g), magnesium (41±1 ppm, 1h) silica (23.4±1.8 ppm, 1e), and sulfate (125±3 ppm, 1i) were determined gravimetrically, chloride was determined volumetrically (18±0 ppm, 1b), and iron (0.05±0.00 ppm, 1d) and nitrate (4.0±0.2 ppm, 1c) were determined colorimetrically according to standard methods. Each value reported is the mean of four parallel determinations. The sum of the calcium and magnesium expressed as total hardness is 453 ppm of calcium carbonate. The pH of the hard water, determined with a glass electrode in the Laboratory of Soil Chemistry, varied from 7.48±0.02 to 7.82±0.02 on different days.

Analysis of the Sodium Aryl Sulfonate

Variation in composition of this heat-labile detergent, described as a monoalkyl monohydroxy benzenesulfonate, was exaggerated by the use of air-dry samples weighed at different humidities.

a. *Alcohol-insoluble matter.* Two determinations were made by extracting three-gram samples of air-dry detergent in a Soxhlet extractor with 95 per cent ethanol for sixteen hours or until no more dissolved and drying the ethanol-insoluble residue to constant weight at 105 to

TABLE V
Shrinkage of washed fabric.

Fabric	Washing	Warp shrinkage			Filling shrinkage		
		Water	Aryl sulfonate	Soap	Water	Aryl sulfonate	Soap
	number	%	%	%	%	%	%
1. Cellulose-acetate rayon.	1	*2*	5	5	0	0	0
	10	5	5	5	0	0	0
	20	7	5	7	0	*2**	2
	30	7	7	7	*2*	*2*	0
	40	5	7	7	0	0	0
	50	7	5	7	*2*	*2*	*2*
2. Cotton	1	3	4	4	1	1	3
	10	5	5	5	1	1	1
	20	5	5	7	3	1	1
	30	5	5	5	1	1	1
	40	5	7	5	1	1	1
	50	5	7	5	1	1	1
3. Linen	1	6	6	6	4	8	3
	10	4	4	7	4	5	5
	20	4	4	6	6	6	3
	30	3	4	6	6	5	4
	40	6	4	7	4	3	4
	50	4	6	6	3	*1*	4
4. Regenerated-cellulose rayon	1	6	6	6	5	6	5
	10	8	8	8	4	3	3
	20	8	8	9	4	1	4
	30	8	9	9	0	1	4
	40	8	9	10	5	3	1
	50	8	9	10	1	3	*1*
5. Silk	1	7	5	9	12	11	12
	10	6	5	3	7	8	8
	20	5	3	1	8	8	8
	30	1	3	1	8	8	8
	40	*1*	2	5	8	8	8
	50	0	1	7	8	8	8
6. Wool	1	7	7	7	13	7	8
	10	16	25	7	18	19	5
	20	16	32	7	18	25	7
	30	16	37	9	19	27	8
	40	*27*	**	9	19	**	8
	50	40	**	11	25	**	8

* Stretch is shown by italics.
** The yarns of these felted wools could not be separated for counting.

TABLE VI
Effect of rinse on shrinkage of wool during six washings.

Rinse	Direction	Shrinkage of wool: Washed with 0.2 per cent sodium alkyl sulfate* in hard water	Washed with 0.2 per cent sodium aryl sulfonate in hard water	Washed with 0.2 per cent sodium glyceryl sulfonate* in hard water	Washed with 0.5 per cent sodium soap in hard water
		percentage	percentage	percentage	percentage
Conductivity water	Warp	26	26	29	..
Distilled water**	..	26	26	..	26
Hard water		26	26	..	13
Conductivity water	Filling	16	16	16	..
Distilled water**	..	17	17	..	17
Hard water		17	17	..	5

* Commercial preparations containing sodium sulfate.
** Wool washed in distilled water was tinted green by a trace of copper in the water (1a).

110°C.; the mean of four determinations (Lot 1), made by shaking one-gram samples of air-dry detergent with ethanol and filtering, rinsing, and drying the residue until

TABLE VII
Warp breaking strength of wet washed fabric.

Fabric	Washing	Water	Aryl sulfonate	Soap
	number	percentage of original wet strength	percentage of original wet strength	percentage of original wet strength
1. Cellulose-acetate rayon	1	96	96	96
	10	96	96	90
	20	96	98	92
	30	92	98	92
	40	96	96	92
	50	92	92	98
2. Cotton	1	96	99	88
	10	91	88	86
	20	88	86	86
	30	90	88	83
	40	90	84	86
	50	84	86	84
3. Linen	1	..	84	69
	10	72	76	56
	20	65	75	57
	30	63	78	50
	40	53	72	50
	50	56	53	44
4. Regenerated-cellulose rayon ...	1	94	91	91
	10	88	84	84
	20	78	81	78
	30	81	78	75
	40	78	75	78
	50	78	72	78
5. Silk	1	96	96	96
	10	96	100	87
	20	78	91	78
	30	74	83	74
	40	65	70	61
	50	61	70	61
6. Wool	1	89	97	89
	10	74	71	91
	20	74	71	89
	30	69	74	89
	40	60	*	89
	50	51	*	89

* The yarns of these felted wools could not be separated for counting.

constant, was 60.58±0.96 per cent. These residues gave positive tests for sodium and sulfate but no test for carbonate, chloride, phosphate, or potassium.

b. *Ash.* Four one-gram samples of Lot 1 of the air-dry detergent ashed at 500°C. in an electric muffle furnace unt'l constant in weight gave a mean of 62.84±0.13 per cent. One-gram samples of Lot 1 or five-gram samples of Lot 2 or Lot 3 of the air-dry detergent were ashed, treated with concentrated sulfuric acid, dried and again ashed; the means of four determinations for each lot were, respectively, 63.59±0.03, 58.84±0.03, and 69.25±0.11 per cent.

c. *Diethyl-ether extract.* The mean of the diethyl-ether extracts determined by difference and the residues from evaporation of the diethyl-ether extracts of three three-gram samples of Lot 1 was 19.21±0.34 per cent[5].

d. *Hydrolysis.* Boiling 3*N* hydrochloric acid failed to hydrolyze the sulfonate to sulfate in four hours[25].

e. *pH of solution in distilled water.* A solution of the

TABLE VIII
Warp elongation of wet washed fabric at breaking load.

Fabric	*Washing number*	*Water percentage*	*Aryl sulfonate percentage*	*Soap percentage*
1. Cellulose-acetate rayon	0	32	32	32
	1	33	33	32
	10	35	33	33
	20	34	35	33
	30	34	35	34
	40	34	34	33
	50	32	33	33
2. Cotton	0	19	19	19
	1	25	23	23
	10	27	23	20
	20	27	23	20
	30	24	23	21
	40	25	22	22
	50	26	23	23
3. Linen	0	8	8	8
	1	12	8	9
	10	9	8	9
	20	9	10	12
	30	10	9	10
	40	9	12	10
	50	8	11	9
4. Regenerated-cellulose rayon	0	19	19	19
	1	23	23	22
	10	22	20	21
	20	20	21	20
	30	20	19	20
	40	19	19	20
	50	19	18	20
5. Silk	0	45	45	45
	1	43	43	43
	10	41	44	40
	20	39	37	38
	30	32	36	35
	40	32	32	34
	50	31	30	31
6. Wool	0	56	56	56
	1	59	59	56
	10	61	71	55
	20	59	89	58
	30	59	101	56
	40	74	108	57
	50	74	100	59

detergent in distilled water, 0.014 per cent by weight, showed a pH of 6.79; one 0.035 per cent by weight had a pH of 6.69.

f. *Sulfur.*

1. *Inorganic sulfur.* The ammonium-chloride washings from the Hart determination of organic sulfur were diluted to 500 ml. with water before 100-milliliter aliquots were analyzed gravimetrically for total sulfate. The value for Lot 2 (10.63±0.16 per cent of sulfur or 47.12±0.68 per cent as sodium sulfate) is the mean of three determinations with five-gram samples and that of Lot 3 (13.53±0.03 per cent of sulfur or 59.96±0.12 per cent as sodium sulfate) is the mean of four determinations with one-gram samples of air-dry detergent, corrected for sulfur of reagents. Ashing of the benzene extract yielded a residue, 0.15 per cent of the air-dry detergent.

2. *Organic sulfur.* The value for Lot 2 (4.05±0.08 per cent) is the mean of three and that of Lot 3 (3.92±0.24 per cent) is the mean of six determinations with five-gram samples of air-dry detergent according to Hart's method[20]. These analyses suggest that more than half of the organic sulfur of this aryl sulfonate was converted to sodium sulfate upon ashing, contrary to Hart's descriptions of other sulfonates.[19, 18]

3. *Total sulfur.* The total sulfur of lot 1 (16.11±0.04 per cent) is the mean of four determinations according to the Benedict-Denis method[7, 9] with one-gram samples of air-dry detergent; the values for total sulfur of Lot 2 (14.77±0.13 per cent) and Lot 3 (17.29±0.07 per cent) are each the mean of three determinations with 0.3-gram samples of air-dry detergent according to the Parr-Bomb method[31].

Analysis of the Sodium Soap

Values for alcohol-insoluble matter (0.70±0.01 per cent), alkalinity of its aqueous extract (0.17±0.01 per cent as sodium oxide), the water-insoluble residue of this aqueous extract (0.35±0.05 per cent), anyhydrous soap (95.44±0.18 per cent), combined alkali (10.72±0.04 per cent as sodium oxide), and matter volatile at 105°C. (3.82±0.04 per cent) are each the means of four determinations with five-gram samples of air-dry soap. The acid number of the fat acids (203.5±0.1) is the mean of three determinations with three-gram samples of air-dry fat acids and the titer of the fat acids (36.1±0.1°C.) is the mean of four trials. All these determinations and the tests for free acid (none), free alkali (none), and unsaponified and unsaponifiable matter (none) were made according to standard methods[36].

Analysis of Fabrics

Physical analyses of the original and the washed cloths were made at the same time.

a. *Absorption of light.* The mean of five readings with a *Pfaltz and Bauer Reflectometer Universal Model MU* is reported for each cloth[4].

b. *Ash.* A sample of air-dry cloth, one to five grams according to its bulk, was dried at 105 to 110°C. for two-hour periods until successive weighings checked and then ignited to constant weight in a porcelain crucible at the dull red heat of an electric furnace; each value is the mean of four or more determinations.

c. *Breaking strength and elongation at breaking load.* The original cloths were tested for both warp and filling strength by the inch-strip method[3] after one week at 65±2 per cent relative humidity and 70±2°F. and when wet; the washed cloths, as the original, were tested for wet warp strength after two hours' immersion in tap water at room temperature. A load of 6 oz. was clamped across the lower end of each raveled specimen before it was clamped between the lower jaws. These determinations were all made within four successive days with a *Scott Universal Tester* and autographic recorder; the mean strength per yarn was computed from twenty determina-

TABLE IX
Weight of washed fabric.

Fabric	Washing	Weight of washed fabric			Weight of area of washed fabric corresponding to one square yard of original fabric		
		Water	Aryl sulfonate	Soap	Water	Aryl sulfonate	Soap
	number	percentage of original fabric	percentage of original fabric	percentage of original fabric	percentage of original fabric	percentage of original fabric	percentage of original fabric
1. Cellulose-acetate rayon	1	102	105	103	100	100	98
	10	103	105	107	98	100	100
	20	105	105	102	98	100	97
	30	103	103	106	98	98	99
	40	105	105	106	98	99	99
	50	102	103	105	97	100	100
2. Cotton	1	103	105	105	99	100	98
	10	106	107	108	99	100	101
	20	107	107	110	99	100	101
	30	104	107	112	97	100	104
	40	107	109	112	100	100	105
	50	109	108	116	101	99	108
3. Linen	1	107	110	105	98	95	96
	10	103	105	108	95	95	95
	20	109	105	105	98	94	97
	30	106	104	110	97	95	98
	40	102	102	110	93	95	99
	50	101	98	110	94	94	98
4. Regenerated-cellulose rayon	1	116	113	114	103	100	102
	10	116	113	119	105	102	104
	20	114	113	115	101	103	102
	30	108	111	116	100	100	102
	40	114	112	116	100	102	102
	50	112	113	113	102	100	102
5. Silk	1	116	114	111	95	98	101
	10	108	116	111	95	102	100
	20	107	120	116	94	107	106
	30	105	119	125	95	107	114
	40	105	115	137	98	104	121
	50	104	119	149	96	108	128
6. Wool	1	119	123	120	96	107	102
	10	145	189	130	100	118	115
	20	149	234	136	102	119	118
	30	151	273	144	102	125	120
	40	209	294	150	103	*	126
	50	224	305	155	101	*	127

*The yarns of these felted wools could not be separated for counting.

tions. Elongation at breaking load was measured to 1/9 in. on the stress-strain chart; the mean elongation of twenty specimens was computed as percental increase in length.

d. *Distribution of yarns by number and weight.* Each yarn count is the mean of five determinations[3]; the yarns of the felted wool were dissected from the cloth for counting. Warp shrinkage was computed from change in number of filling yarns, expressed as percentage of filling yarns per inch of washed cloth; filling shrinkage was computed from change in number of warp yarns. Each value for the distribution of yarns by weight is the mean of four determinations[4].

e. *Length of fiber.* Each value is the mean of ten determinations.

f. *Moisture.* A sample of original or residual wool, after two years' storage in a heavy envelope, was conditioned at 65±2 per cent relative humidity and 70±2°F. for a week, weighed in a weighing bottle, and dried for two-hour periods at 105 to 110°C. until successive weighings checked; the average loss in weight of two five-gram samples is expressed as percentage of moisture in conditioned cloth.

g. *Sulfur.*

1. *Sulfate sulfur.* The mean sulfate sulfur of the original or the once-washed wool was computed from four determinations according to Mease's method[27]; duplicate determinations with the other washed wool showed no sulfate sulfur.

2. *Total sulfur.* The mean total sulfur of the wool, corrected for sulfur of the reagents, was computed from four or more determinations with five-gram samples according to the Benedict-Denis method.[7, 9]

TABLE X
Sulfur of washed wool.

Washing number	Water		Total sulfur Aryl sulfonate		Soap		Water	Sulfate sulfur Aryl sulfonate	Soap
	percentage of washed fabric dried at 105° C.	percentage of original fabric**	percentage of washed fabric dried at 105° C.	percentage of original fabric**	percentage of washed fabric dried at 105° C.	percentage of original fabric**	percentage of washed fabric dried at 105° C.	percentage of washed fabric dried at 105° C.	percentage of washed fabric dried at 105° C.
0	3.65 (0.00*)	....	3.65 (0.00)	....	3.65 (0.00)	....	....	....	....
1	3.63 (0.03)	3.46	3.50 (0.01)	3.74	3.69 (0.02)	3.75	0.03	0.03	0.03
10	3.57 (0.01)	3.52	3.61 (0.02)	4.26	3.13 (0.02)	3.63	0.03	0.03	0.04
20	3.55 (0.00)	3.57	3.76 (0.02)	4.47	3.02 (0.03)	3.62	None	None	None
30	3.54 (0.00)	3.59	3.81 (0.02)	4.77	2.84 (0.01)	3.47	None	None	None
40	3.51 (0.00)	3.60	3.84 (0.03)	***	2.76 (0.03)	3.56	None	None	None
50	3.54 (0.00)	3.56	3.87 (0.03)	***	2.67 (0.02)	3.47	None	None	None
							None	None	None

* Mean deviations are within parentheses.

** Based on weight of washed fabric dried at 105° C. times $\frac{AxA'}{BxB'}$ where A and B are the conditioned weights of the original and the washed fabric and A′ and B′ are their percentages of total solids.

*** The yarns of these felted wools could not be separated for counting.

h. *Thickness of fabric.* The mean of ten measurements is reported[6].

i. *Twist of yarn.* Mean twist per inch of yarn was computed from ten determinations with an *Improved United States Testing Company Tester.*[2, 4]

j. *Weight of fabric.* Four specimens, 4 in. long and the entire width of the cloth, were conditioned for one week at 65±2 per cent relative humidity and 70±2°F. and weighed to the nearest milligram[3]. The width of the washed cloth was computed from width of original cloth and numbers of warp yarns per inch of original and washed cloths.

k. *Yarn number.* Four ten-yard lengths of each set of yarns of the original cloth were conditioned and weighed to the nearest milligram.

TABLE XI
Moisture of conditioned wool.

Washing number	Water percentage of conditioned wool	Moisture Aryl sulfonate percentage of conditioned wool	Soap percentage of conditioned wool
0	12.19 (0.04+)	12.19 (0.04)	12.19 (0.04)
1	13.18 (0.00)	12.51 (0.06)	12.43 (0.02)
10	13.39 (0.03)	12.27 (0.08)	11.39 (0.16)
20	13.42 (0.11)	12.14 (0.03)	10.72 (0.38)
30	12.65 (0.02)	12.05 (0.02)	10.72 (0.30)
40	12.75 (0.02)	12.08 (0.14)	10.23 (0.07)
50	12.76 (0.05)	11.95 (0.03)	10.08 (0.15)

* Mean deviations are within parentheses.

ACKNOWLEDGMENT

Appreciative acknowledgment is made for the gift of a Pfaltz and Bauer Reflectometer and the grant of funds from General Mills, Inc., which made possible this investigation. The authors also wish to thank Dr. Alonzo E. Taylor for his generous help throughout the course of the work, Dr. Clyde Ogg for determining the pH of the hard water, Eleanor Mitts for determining the moisture of the conditioned wool, and Grace Anderson, Irene Anderson, and Wilma Weidlein for help with the washing of the fabrics.

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TRADE NOTES • NEW PRODUCTS

OBITUARY

THOMAS C. DAVIS

THOMAS C. DAVIS of Gastonia, N. C., for thirteen years a starch, gum and dextrine representative of Stein, Hall & Co., Inc. at its Southern Branch in Charlotte, died in the Charlotte Hospital March 1st from an ear infection. He was taken to the hospital the day before his death after having been confined to his home for several days.

Mr. Davis was born in Tucapau, S. C., February 12, 1907. He joined the Stein-Hall organization soon after his graduation from Clemson College in 1930. He was a member of the First Presbyterian church and the Lions club.

Surviving are his widow, two daughters, his parents, and two brothers.

• JOIN QUAKER CHEMICAL

Quaker Chemical Products Corporation of Conshohocken, Pa., developers and manufacturers of chemical products for the metal working and textile fields, announce several recent additions to their organization. Tulio Cordero, a graduate of the University of Cincinnati and the George Washington University, formerly connected with the United Drug Co. in Boston, has been added to the research laboratory staff, as has Dr. Boris Schwartz, who received his Ph.D. in organic chemistry from Rutgers University last Spring.

D. W. Prichard, who holds a B.S. degree in chemistry from Pennsylvania State College and was formerly associated with W. H. & L. D. Betz, of Philadelphia, consulting chemical engineers, has joined Quaker's technical sales division.

• APPOINTED VICE-PRESIDENT

Chester L. Baker, Chemical Director of the Philadelphia Quartz Company, Philadelphia, has been named Vice-President—Manufacturing & Engineering. Although a North Dakotan, Mr. Baker received his public school education in Lansing, Michigan. From there he moved to California, obtaining a batchelor's degree in Chemistry in 1925 from the University of California, Berkeley. There followed a year at the Pacific Sanitary Manufacturing Company as Assistant Chief Chemist and Superintendent of the Mill Room, manufacturing vitreous enamels for sanitary ware, then a short period in a steel mill control laboratory. At the West End Chemical Company, in the capacity of Assistant Plant Manager and Chief Chemist, he had an active part in the development of a novel process for manufacturing soda ash and borax from Searles Lake brine. This process has proven over the years to be eminently successful. Early in 1927 he became the Chief Chemist of the Philadelphia Quartz Company of California, Ltd., Berkeley. In 1935 he was transferred to the Philadelphia Quartz Company, Philadelphia and in 1940 was appointed Chemical Director, which title he retains.

Mr. Baker is the original developer of the method of commercially manufacturing sodium metasilicate penetahydrate and other crystalline alkali metasilicates and has done considerable work on commercial detergent and adhesive engineering. He also developed and designed a continuous furnace and other equipment and processes for manufacturing silicate of soda. Numerous patents have been granted to him in this country and abroad and his scientific and technical papers have been widely published.

Other appointments announced by the company include Claire H. Jeglum—Assistant to Chemical Director, Harry L. Bolton—Assistant Chemical Manager-Quality Control, and Alfred H. McKinney—Chemical Engineer.

• "E" AWARD TO du PONT

Major General Clifford L. Corbin, Acting Quartermaster General of the United States Army, presented the Army-Navy "E" flag to the Dye Works Associated Units of E. I. du Pont de Nemours & Company at Deepwater Point, N. J., on Thursday, February 25.

An "E" already had been given to the neoprene synthetic-rubber section at the Dye Works. Du Pont employees at all other units of this plant, including those producing dyes, tetraethyl lead for high test gasoline, alcohol, synthetic camphor, refrigerants, pharmaceutical intermediates, textile agents, seed disinfectants and numerous other essential products, received "E" pins.

Ted Jewett of du Pont's "Cavalcade of America" radio program was master of ceremonies. The program opened with the raising of the American flag by a color guard of plant guards and soldiers of the Delaware Ordnance Depot. The singing of "The Star-Spangled Banner" followed.

Dr. William Kirk, manager of the Dye Works, accepted the flag for management and employees.

W. S. Carpenter, Jr., president of the du Pont Co., congratulated the plant on its award and spoke briefly on the significance of the Dye Works in the history of the organic chemical industry in this country.

The "E" pins were presented by Captain C. G. Mayo, U.S.N., District Supply Officer, Fourth Naval District, and accepted for the employees by W. W. Weatherby, president of the Deepwater Industries Bargaining Agency. He was assisted by A. L. Brown, Smith Davenport, and Miss Clara Thompson, selected for the honor because of their long service records. The ceremony closed with the singing of "America."

Since this is a vital war plant, operations did not stop during the program, but all employees who could possibly be away from their work attended. Radio Station WDEL of Wilmington broadcast the ceremony. Music was furnished by the Pennsville Community Band, directed by Percy Rostaing

The modern Dye Works Associated Units has grown from a very small plant for making indigo and sulfur black built in 1917 on what was then swampy Jersey farmland. This first plant was the result of research by duPont scientists in creating desperately needed dyes and chemicals—materials on which Germany held a virtual monopoly and which could no longer be imported because of the war.

The young Dye Work's position was precarious when the war ended. However, realizing America's economic need for this industry and believing its perseverance would some day be rewarded, du Pont continued to expend time and money.

Since 1921 the dyes industry has made

continual progress. Techniques were improved, yields were greater, color qualities continued to improve, and prices went down. The weighted average price of dyes, for example, declined from $1.08 per pound in 1920, to 62 cents per pound in 1940, despite the fact that a much larger percentage of the faster and higher priced dyes were used in 1940 than in 1920. Today this du Pont plant alone is said to supply more than half the anthraquinone vat dyes specified for a variety of cotton equipment for our armed forces, and America produces all the colors it needs.

Knowledge and experience gained in work with dyes and their intermediates prompted numerous chemical achievements of importance. Striking examples include neoprene synthetic rubber, one of seven materials placed on the first war priority list in 1941; synthetic camphor, to replace natural camphor formerly imported from Formosa; organic chemicals for processing and vulcanizing rubber; tetraethyl lead, used to make high-octane gasoline; intermediates for pharmaceuticals and a host of other products essential in war and peace.

● JOINS WARWICK CHEMICAL

Samuel A. Moffitt has been appointed as technician and sales representative for the Warwick Chemical Company at West Warwick, R. I. For many years, Mr. Moffitt was identified with the bleaching, dyeing, finishing and printing industry, holding at

Samuel A. Moffitt

various times the position of superintendent at the Amoskeag Manufacturing Company, the Imperial Printing and Finishing Co., and the Riverside & Dan River Mills. He has been with the Warwick Chemical Company since January 15th.

● COTAN CORP. ACQUIRED

Last month Interchemical Corporation acquired substantially all of the stock of Cotan Corporation. The former personnel is being retained with C. T. Melvin as President and R. F. Lewis as Vice-President.

This corporation has been in the business of coated fabrics such as those used for upholstery, women's handbags, theatre seats, automotive upholstery and similar uses. Cotan recently delivered substantial quantities of coated fabrics for raincoats and other uses by the armed forces.

W. F. Cornell of the parent company, Interchemical Corporation, will devote most of his time in the immediate future to the study of markets for Cotan products for war application as well as for post war sales.

The other divisions and subsidiary companies of Interchemical Corporation and their products are: International Printing Ink Division—Typographic and Lithographic Inks; Ault & Wiborg Corporation—Industrial Finishes, Lacquers, Enamels; Ault & Wiborg Carbon & Ribbon Div.—Carbon Paper and Typewriter Ribbons; Champlain Division — Printing Presses; United Color & Pigment Co. Div—Dry Colors, Lithopone, Titanium Dioxide; Intag Div.—Inks for Rotogravure Printing; Aridye Corp.—Aridye Textile Colors; Ruxton Products, Inc.—Artists' Materials; The Ault & Wiborg Co. (Far East)—Printing Inks, Machinery and Paper; The Ault & Wiborg Co. of Canada Ltd.—Printing Inks, Textile Colors, Paints; Virginia Chemical Corp.—Titanium Dioxide; R-B-H Dispersions, Inc.—Color Dispersions; Standard Coated Products Corp.—Sanitas Wall Covering, Meritas Oilcloth, Table Covers; Cotan Corporation—Coated Fabrics.

● "E" AWARD TO MATHIESON

The Niagara Falls plant of The Mathieson Alkali Works (Inc.) has been presented with the Army-Navy Production Award for high achievement in the production of chlorine, synthetic ammonia, caustic soda, high test calcium hypochlorite, sodium chlorite, sodium methylate, and other chemicals that are vitally needed for the nation's war effort.

The "E" flag, which symbolizes the award, was presented on February 26 by Col. Harry A. Kuhn, of the Office of the Chief, Chemical Warfare Service, Washington, D. C., and was accepted by G. W. Dolan, executive vice-president of the Mathieson organization. Col. Kuhn was introduced by Lt. Col. Charles F. Mosher, Officer-in-Charge of the Buffalo Sub-Office, Rochester Ordnance District, representing Col. F. J. Atwood, of the District. Master of Ceremonies was Rob Roy Macleod, executive vice-president of the Niagara Falls Power Company.

"E" pins were presented by Lt. Comm. George W. Eighmy, U.S.N.R., of Buffalo, to a committee representing the plant employees, whose members were Frank A. Sweet, Chairman, George Allinson and Jacob Gessner, and to F. B. Butler, Manager of Mathieson's Niagara Operations..

In his presentation address, Col. Kuhn pointed out that the chemicals used in making war materials and for preserving the health of our armed forces are just as important for winning battles as the high-explosive shells that blast the enemy out of their rat holes.

"This plant started operations on Thanksgiving Day, 1897; we in the military service have had occasion to be thankful for this plant in two wars," said Col. Kuhn. "In 1917, the Chemical Warfare Service called on this plant to furnish material and to furnish men to help operate our Edgewood Arsenal. Today, every branch of the Army and the Navy call on this plant for chlorine, caustic soda, for high-test hypochlorite, ammonia, and other products. These products are just as vital to the war as are the tanks, the airplanes, the explosives, the gasoline and the synthetic rubber in which they are used. The chlorine which made possible the pure water furnished our troops on Guadalcanal played just as vital a part in winning that battle as the high explosive shell that blasted the Japs from their rat holes. Do not for a moment forget that the products you are producing here day by day are playing an important role on every battlefront in the world."

Vice-president Dolan, in accepting the flag, urged his fellow workers to make a solemn pledge to merit a merit star for high production for every six-month period, from now until the end of the war.

Almost without exception, all of the chemicals being produced by the Mathieson plants at Niagara Falls, Saltville, Va., and Lake Charles, La., are needed for war purposes or for essential civilian services.

So important is chlorine in production both for war and peace that it has been called "the chemical of a thousand uses." Ammonia also is essential in making many wartime products, including smokeless powder, TNT and other high explosives, petroleum products, pharmaceuticals, plastics and casehardened metal parts for planes and other war equipment. Caustic soda is essential in refining gasoline and lubricants, in making rayon for parachutes and heavy-duty military tires, in processing textiles and in reclaiming scrap rubber. Sodium chlorite, among many other applications, is used in the oxidation of vat dyes and the after-treatment of sulfur dyes, greatly speeding up the dyeing of cotton olive drab fabrics for the armed forces and permitting greater production with the same processing equipment.

Sodium methylate, a relatively new product of Mathieson's Niagara Falls operations, goes almost entirely into the manufacture of sulfa drugs, which are being used at our fighting fronts to prevent wound infection. Also at the front is calcium hypochlorite, which keeps water supplies safe from disease germs and protects the

health of our armed forces in all parts of the globe.

Another vitally-needed war material is metallic magnesium, which will soon be produced by a newly constructed Mathieson plant.

• FEBRUARY ISSUE, TEXTILE RESEARCH

Better and stronger synthetic fibers will result from proper selection and blending of molecules, according to Prof. E. R. Schwarz, of Massachusetts Institute of Technology, in an article in the February issue of *Textile Research*, official publication of Textile Research Institute, Inc., and the Textile Foundation. The chemist has progressed rapidly in selecting suitable long, slender molecules; and the physicist is recognizing that these molecules must be properly grouped and bound together with electrical energy to prevent slippage of the molecules past one another. Studies made by means of polarized light, ultra-violet light, infra-red radiation, X-ray diffraction, and electron microscope techniques are giving an ever-clearer picture of the real "inside story" of fiber structure and are pointing the way toward the synthesis of synthetic fibers to meet specific purposes.

To make secure America's world leadership in the practical application of scientific studies and to mobilize for maximum war effort the full powers of our technically trained manhood and all-technical facilities, processes, and knowledge, is the stated purpose of a bill which has been introduced to the Senate providing for the creation of a Technological Mobilization Corporation. An article in the February issues of *Textile Research* discusses the powers which it is proposed to give to this corporation and outlines the testimony presented by leading industrialists at the first hearings on the bill.

Also included in the February issue of *Textile Research* are reports of research on the extent to which wool combines with various weak acids to which it is exposed during processing and on the effect of twist on the tensile strength of cotton fiber bundles. Another feature is an article describing how American manufacturers can obtain the right to use processes covered in patents granted to foreign nationals and seized by the Alien Property Custodian.

• APPOINTED ASST. GENERAL MANAGER

J. Warren Kinsman has been appointed assistant general manager of the Organic Chemicals Department of E. I. du Pont de Nemours & Company, to succeed the late Cesare Protto, it was announced recently. Dr. J. A. Almquist, will succeed Mr. Kinsman as assistant general manager of the Plastics Department.

Mr. Kinsman joined Du Pont on May 1, 1915, at the High Explosives Operating Department at the Bayway plant. Successively, he was supervisor in the "Fabrikoid" Department, a sales correspondent at Du Pont Chemical Works, and an assistant supervisor at the Carney's Point, N. J. plant.

Mr. Kinsman was made a special assistant in the Dyestuffs Department on March 1, 1921. In 1924, he was named assistant director of sales in that department, and became director of sales of Organic Chemicals in 1929. His appointment to the managership of the Alcohol Division followed in 1931, and ten years later was appointed assistant general manager of the Plastics Department.

J. Warren Kinsman

He was born in Elizabeth, N. J., and educated in the Elizabeth schools and Wesleyan University.

He is a member of the Wilmington Country Club, Wilmington Whist Club, Du Pont Country Club, Concord Country Club, Chemists' Club of New York and Westminster Presbyterian Church.

Dr. Almquist, who succeeds Mr. Kinsman, has been chemical director of the Plastics Department since September, 1941.

Joining the Du Pont Company in 1927, Dr. Almquist was first associated with the Ammonia Department where he served for fourteen years. He was, successively, a chemist in the Chemical Division at Belle, W. Va., and at Washington; research manager of the Chemical Division from 1930-1935; and assistant chemical director until 1941, when he joined the Plastics Department.

He was born in Moscow, Idaho, and attended Moscow High School, was graduated from the University of Idaho as a chemical engineer, and received his doctorate at the University of California. He is a member of the Kennett Square Golf Club.

• PLACEMENT COMMITTEE

The demand at this time for trained technicians for war work in the textile industry has prompted the Board of Governors of the American Association of Textile Technologists to appoint a new Placement Committee. W. F. Macia of the A. M. Tenney Associates, and 1st Vice-president of the Association, is to be chairman of this Committee.

It is the purpose of the committee to assist unemployed members in getting properly placed where they can contribute their trained skill to the war effort as well as to assist employers obtain suitably trained men to fill vacancies on their technical staffs.

The new Placement Committee does not intend to encourage pirating of technicians in the industry, or to concern itself greatly with men now employed, but is seeking to establish a system of obtaining positions for trained members who are not employed or who are now engaged in other non-essential fields.

A complete confidential file of men available with their qualifications, will be maintained so that the proper information can be furnished empoyers seeking trained technicians. This committee will strive to cooperate with governmental and commercial agencies and employers seeking textile technicians in getting the right man to fill the position.

Unemployed A.A.T.T. members seeking work and agencies and employers interested in obtaining trained textile technicians are urged to communicate with W. F. Macia, Chairman of A.A.T.T. Placement Committee, c/o A. M. Tenney Associates, Inc., 10 East 40th Street, New York City. All inquiries will be treated as confidential.

• DCAT ANNUAL DINNER

The Drug, Chemical and Allied Trades Section of the New York Board of Trade held its 18th Annual Dinner on Thursday, March 4, 1943 at The Waldorf-Astoria. The Ballroom was completely sold out in advance of the Dinner, more than 2200 reservations having been made.

Following a policy begun last year that a worthy war charity be selected as a beneficiary of the Dinner, the United Seamen's Service was this year's selection.

Victor E. Williams, Chairman of the Section, in his opening remarks emphasized the important contribution of the American merchant marine by saying: "I want to say that in making plans for this meeting tonight, we were especially anxious to have the largest possible attendance, so that the United Seamen's Service would be assured of a substantial donation—and you will note how well that has come to pass by looking around you. Only in the past few months have many Americans come to appreciate the vital work our Merchant Marine is doing in carrying supplies to our Armed Forces and those of the Allied Nations. This charity, to which we are making this year's contribution, exists for the sole purpose of rehabilitating the personnel of the American Merchant Marine.

We pay homage to these unsung heroes and are happy for the privilege of contributing to their comfort and happiness. May I, therefore, in the name of the Drug, Chemical and Allied Trades Section of the New York Board of Trade, thank you most sincerely for your support of this, our 18th Annual Dinner."

Senator Robert R. Reynolds of North Carolina, Chairman of the Senate Military Affairs Committee, was the guest speaker.

• COTTON INDUSTRY IN LATIN AMERICA

The Latin American Economic Institute has recently published a pamphlet containing an article by Albert L. Scott, president of Lockwood Greene Engineers, Inc., which presents a survey of the cotton textile industry in Latin America. The article consists of a paper read at the round table conference conducted by the Institute in New York on November 5th. Also included in the pamphlet are remarks made at the conference by Fessenden S. Blanchard, president of the Textile Research Institute and Julian Jacobs, editor of *Textile Research*.

Copies of the pamphlet are available at 50c each from the Latin American Economic Institute, 429 West 117th Street, New York City.

• TENNESSEE EASTMAN REPRESENTATIVE

The Tennessee Eastman Corporation announces the appointment of F. L. Bume as New York sales representative for its acetate dyestuffs.

Mr. Bume has been in the dyestuffs industry since 1914 and has had wide experience in the manufacture, sale, and technical application of dyestuffs. Mr. Bume's offices are located at 10 East 40th Street, New York City.

F. L. Bume

Tennessee Eastman Corporation offers an expanding line of dyestuffs for application to acetate rayon and nylon. A very intensive research program is being conducted to develop improved dyes for acetate rayon, with particular emphasis being directed toward colors with better fastness properties. Already commercially developed, though restricted because of war demands, is Eastman's process for the discharge printing of acetate fabrics.

• RECOVERY OF GLYCERIN

Glycerin, vital base of nitro-glycerin, is recovered in soap manufacturing more quickly and economically than heretofore, and in substantially larger quantities, by a new alcohol process developed by the Fine Chemicals Division of E. I. du Pont de Nemours & Company, it was announced recently.

Nitroglycerin is so critically needed that the government now permits soap manufacture only when glycerin is recovered. Housewives have been asked to salvage cooking fats for their glycerin content.

This process is said to swiftly and economically recover the critically needed product from domestic fats, whereas most of it formerly was extracted from coconut oils of high glycerin content imported from islands in the Pacific. It is also said to mark an important step forward in the manufacture of soap, and may be used generally after the war, the company state.

Recovery is more economical because less heat and water are required than for older processes, equipment is smaller and more compact, and stainless-steel equipment is unnecessary since the reaction can be carried out at ordinary temperature and pressures in iron vessels.

In addition to larger and faster recoveries, the method gives water-free glycerin that can be used directly in many processes, including that for making "Dulux" synthetic resins used in war paints.

In soap manufacture it has many advantages. The by-product glycerin is obtained early in the operation, not at the end as heretofore. From the esters produced by the process, quality soap can be made under efficient operating conditions. It lends itself to continuous operations, and water-free soaps can be produced directly. The esters left after separating the glycerin are also used in numerous syntheses now important to the war effort.

• CLASSIFIED ADVERTISEMENTS •

WANTED: Textile chemist-analyst, male or female. Routine chemical and dyestuff testing. Good opportunity for right person. State education, experience, draft status, and salary expected. Write Box No. 425.

WANTED: Salesman—textile chemicals and specialties. Penna. and N. J. Experienced in dyeing and finishing preferred. Write Box No. 428.

WANTED: Finisher for rayon fabrics capable of making up his own finishes and initiating work on new finishes. State experience and salary required. Write Box No. 429.

WANTED: Unusual opportunity for chemist with textile processing experience to persuade mills to use special chemicals. Send details. Write Box No. 430.

WANTED: Superintendent of dyeing wanted for large commission yarn dye house. Thorough knowledge of package dyeing necessary. Conversant knowledge of mercerizing, skein, and warp dyeing desired. Write giving complete experience and draft status. Box No. 431.

POSITION WANTED: Young, ambitious chemist and textile engineer (23) with experience in spinning, weaving and dyeing. Now employed in laboratory of large dyestuff concern. Familiar with all types of cotton machinery and woolen spinning machinery and with the application of all types of dyes on all types of material. Would consider job as assistant to busy executive, textile chemist, assistant dyer (preferably both combined) in testing laboratory or as second hand. Free from draft. References. Write Box No. 432.

WANTED—Pfaudler acid proof kettles, jacketed or unjacketed up to 500 gallons capacity. Several required. Also acid proof condensors; also 18 inch and 30 inch closed delivery fitter presses. Write Box No. 433.

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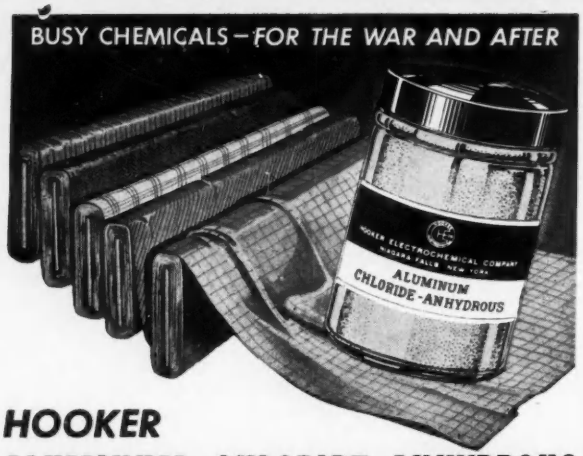

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Description: Light gray colored solid.
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Iron ..... 0.5% Maximum
Heat of Solution, 550 Small calories/gram minimum.

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WOOL

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Add Laurel Mildant A to your lubricating or sizing formulas routinely. It will prevent mold formation on your rayon yarns and hosiery, with its consequent invisible tendering of the fibers, changes in dyeing properties and discoloration of hosiery fabrics.

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Laurel Mildant A is a mill-tested safety measure that pays dividends in longer life of yarn and hosiery, more even dyeing and color. Send for sample order today.

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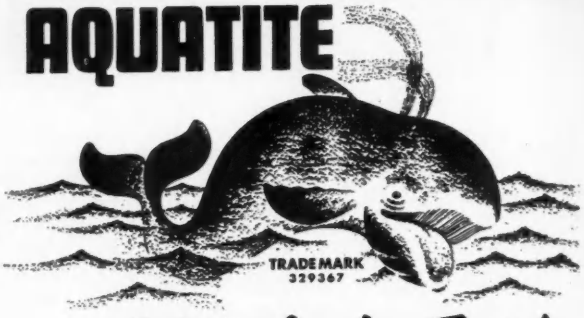

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A one bath water repellent finish for hosiery, cotton duck, rayons, satins, etc., which meets exacting Government specifications as well as all civilian standards.

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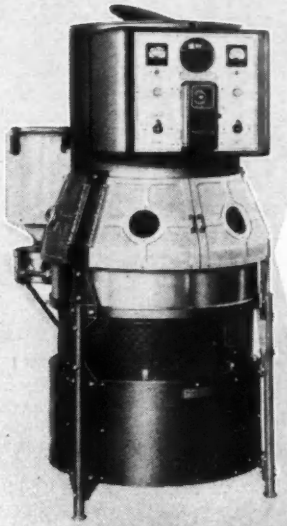
for accelerated color fading



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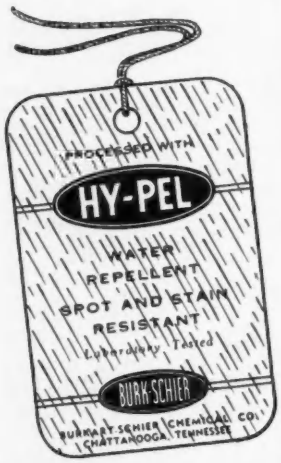

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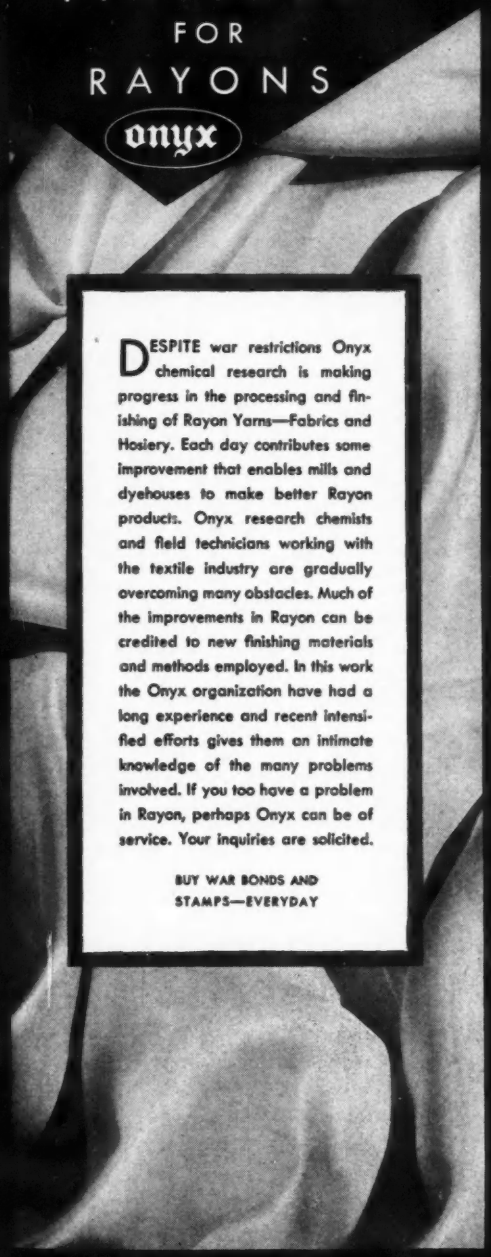

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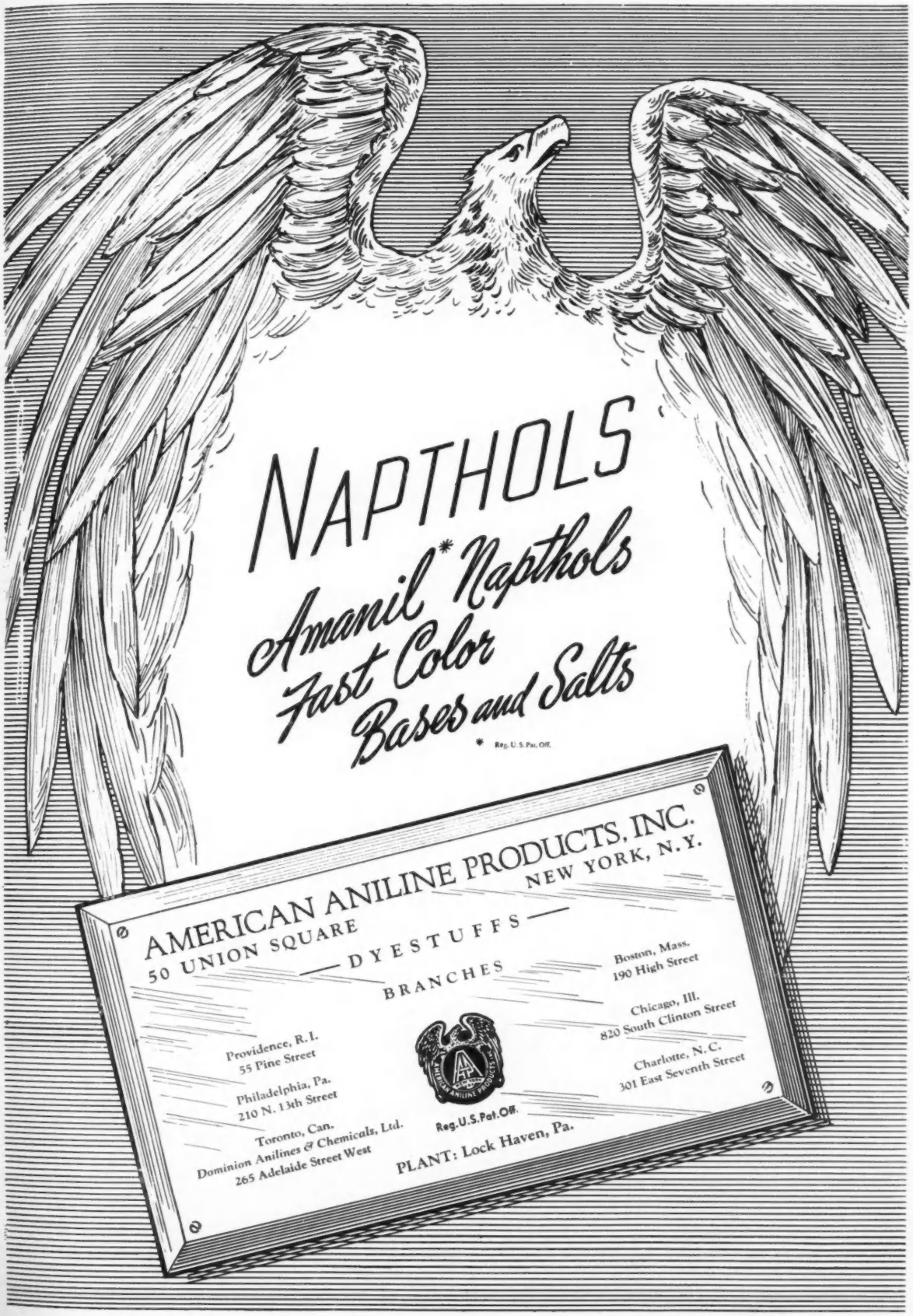
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